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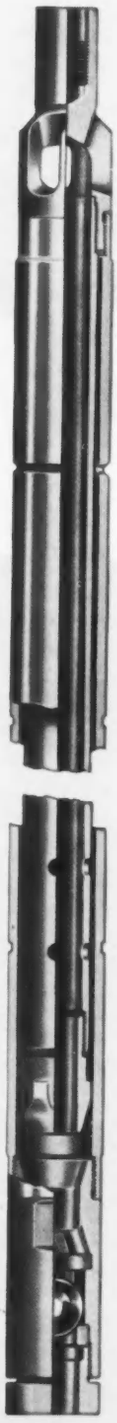

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# WORLD OIL'S 1958 INTERNATIONAL OUTLOOK ISSUE

ESTABLISHED 1916 AS THE OIL WEEKLY

AUGUST 15, 1958 VOL. 147, NO. 3

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## Middle East and South America maps in this issue

Inserted in this issue of WORLD OIL are two 40- by 28-inch wall maps suitable for framing. These maps cover oil and gas fields, oil and gas pipe lines, refineries and other data in the Middle East and South American areas of Venezuela, Colombia, Ecuador, Peru, Bolivia and Trinidad. A limited number of extra copies of these maps are available at 50 cents each. They may be ordered by using the blue Readers' Service Card at the back of this issue.

***Turn the page for a Quick Look at this issue***

*a Quick Look at this issue . . .*

# U. S. outlook is brightening

### DEMAND:

Prospects are brightened by indications demand in last half of 1958 will recover sufficiently to be slightly greater than a year ago levels, a sharp contrast with depressed volumes during the first six months of the year.

### PRODUCTION:

With demand improving and excessive inventories corrected, the outlook is for substantially higher producing rates in coming months. This will provide producers relief from recent exceptionally low production volumes.

### STOCKS:

Biggest improvement is the correction of surplus inventories. Except on the West Coast, stocks are no longer excessive as recent drastic cuts in production and refinery runs result in unusually large inventory liquidation.

### DRILLING:

Prospective higher producing rates are expected to result in greater activity during the second half of 1958 than in the first half of the year. A gain of 6.1 percent in wells and 4.0 percent in footage is predicted.

**The economic outlook** for the U. S. oil industry is brighter than anytime during the past 12 months. Considerable recovery from recent depressed levels is anticipated.

Many of the economic difficulties which have hampered the industry since the spring of 1957 have been corrected, notably the elimination of excessive inventories. Demand is showing signs of improvement.

Consequently, substantially higher producing rates seem certain during the last half of 1958.

**Demand improving.** Total demand for all U. S. oils is expected to show gradual and steady improvement as the year progresses (page 116).

Demand in the second quarter of 1958 was only 2.7 percent below 1957 rates, whereas in the first quarter it had been 6.9 percent below peaks reached in 1957 when large emergency shipments were made to Western Europe because of the Suez Canal crisis. It is highly significant that demand in June rose 2.1 percent above year ago levels.

Additional recovery is anticipated in coming months, and it will be easier for demand to equal last year's volume because consumption had declined in the second half of 1957. Consequently, third quarter demand should be equal or slightly above last year, and fourth quarter demand is likely to be considerably above 1957 volumes. Total demand in the final quarter of 1958 is seen as being 3.2 percent, or 304,000 barrels per day, higher than in the same period of last year.

**Stocks reduced.** Of tremendous importance is the unusually large reductions in U. S. oil inventories during recent months. Except on the West Coast, stocks now are at reasonable levels whereas they had been quite excessive at the beginning of the year.

There actually was less crude oil, gasoline, kerosine, and distillate fuel oil in storage at midyear than at year ago (page 116).

This means the industry can produce and refine at current consuming rates, whereas it had been necessary during the first half of 1958 to curtail these activities below existing demand.

**Production to increase.** U. S. oil producers can look forward to substantially higher producing rates during the the remainder of 1958 (page 118). Chances are good that production in the closing months of 1958 will exceed rates which existed during the last three months of 1957.

It is possible that U. S. crude oil production will be as much as one million barrels per day larger in December than in the spring months of the year, when it averaged only 6⅓ million barrels daily.

**Drilling to Recover.** Increased production will provide producers with both the incentive and funds to drill more wells (page 120). Consequently, it is forecast by WORLD OIL that 1,428 more wells and 3.8 million more feet of hole will be drilled during the second half of 1958 than in the first six months of the year. However, this will be only a partial restoration of drilling to former peaks. The gain in drilling activity over the first half rates is expected to be fairly widespread among the states.

Increased drilling will result in the completion of a larger number of new oil, gas and distillate producing wells (page 123). Higher drilling rates will include an increase in wildcat completions (page 124).

***Expansion seen outside U. S. . . . page 6***

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*a Quick Look at this issue . . .*

# Expansion foreseen outside U.S.

### DEMAND:

A significant increase is anticipated in demand in the world outside the U.S. and the Russian bloc due largely to removal of Western European rationing instituted during 1957 as a result of the Suez Canal closing.

### PRODUCTION:

A sizable increase is anticipated in crude production in the world outside the U.S. This upturn will result primarily from the Middle East, where crude output was restricted during part of last year because of the Suez crisis.

### RESERVES:

Free World's proved crude oil reserves, excluding U.S. and Russia, spiral to record high principally through continued development drilling activity in major producing oil fields of the Middle Eastern countries.

### DRILLING:

While the 1958 drilling forecast for the Free World outside the U.S. follows a downward trend, five oil producing areas are expected to drill more wells this year than they completed during the previous year.

THE PROSPECTS immediately ahead for the oil industry outside the U.S. point to continued expansion. The speed at which this development occurs will depend, in several areas, upon the turn of political events. Included in these areas are the Near East, Middle East and Far East.

In its effort to furnish its readers with detailed and accurate information on complete global oil operations, WORLD OIL has evaluated reports from oil companies, governments and staff correspondents throughout the world. These reports appear in this issue, and furnish extensive information as to where immediate and long-range developments are likely to occur, and why.

On a world-wide basis, outside U.S. and the Russian bloc, this much appears certain:

**Demand.** A sizable increase is anticipated in demand since Western European products rationing has been removed (Page 132). Restrictions on oil use were imposed on the free countries of Western Europe in 1957 as a result of the closing of the Suez Canal.

A portion of this expected increase in demand is credited to the continuing increase in the industrialization and economic activity in South America, Canada, Western Europe, and the heretofore under-developed nations in Asia and Africa. Such expansion, of course, can be expected to add to the demand for residual fuels, distillates, gasoline and other oil products.

**Production.** Production, likewise, is expected to reflect a sizable increase this year outside the U.S. and Russian bloc (See Page 127). The Middle Eastern oil producing countries, of course, will play major roles in this upturn since the area was shut down during part of 1957 also as a result of the Suez canal closing.

A long-range evaluation indicates further growth in crude production due to the industrial expansion forecast for South America, Asia, Africa and Canada, in addition to the significant increase in demand by Western European nations.

**Reserves.** The Free World outside U.S. continued finding more oil than it produced (See Page 134).

A substantial amount—12.8 billion barrels—was added to the total reserves figure at the beginning of 1958 of 186 billion barrels. The new figure is an all-time high.

In following the well-established pattern of recent years, the middle East accounted for a major share—8.2 billion barrels—of the increase. This portion resulted from the normal development of the area's major oil fields.

**Drilling.** A total of 7,864 wells will be drilled in the Free World during 1958, excluding the U.S., WORLD OIL forecasts (Page 125). Five areas are expected to increase drilling rates—Central America by 133 percent, Western Europe by 5 percent, Africa by 20 percent, Middle East by 20 percent, and Far East and Oceania by 17 percent.

***Turn to Page 8 for a country-by-country summary . . .***

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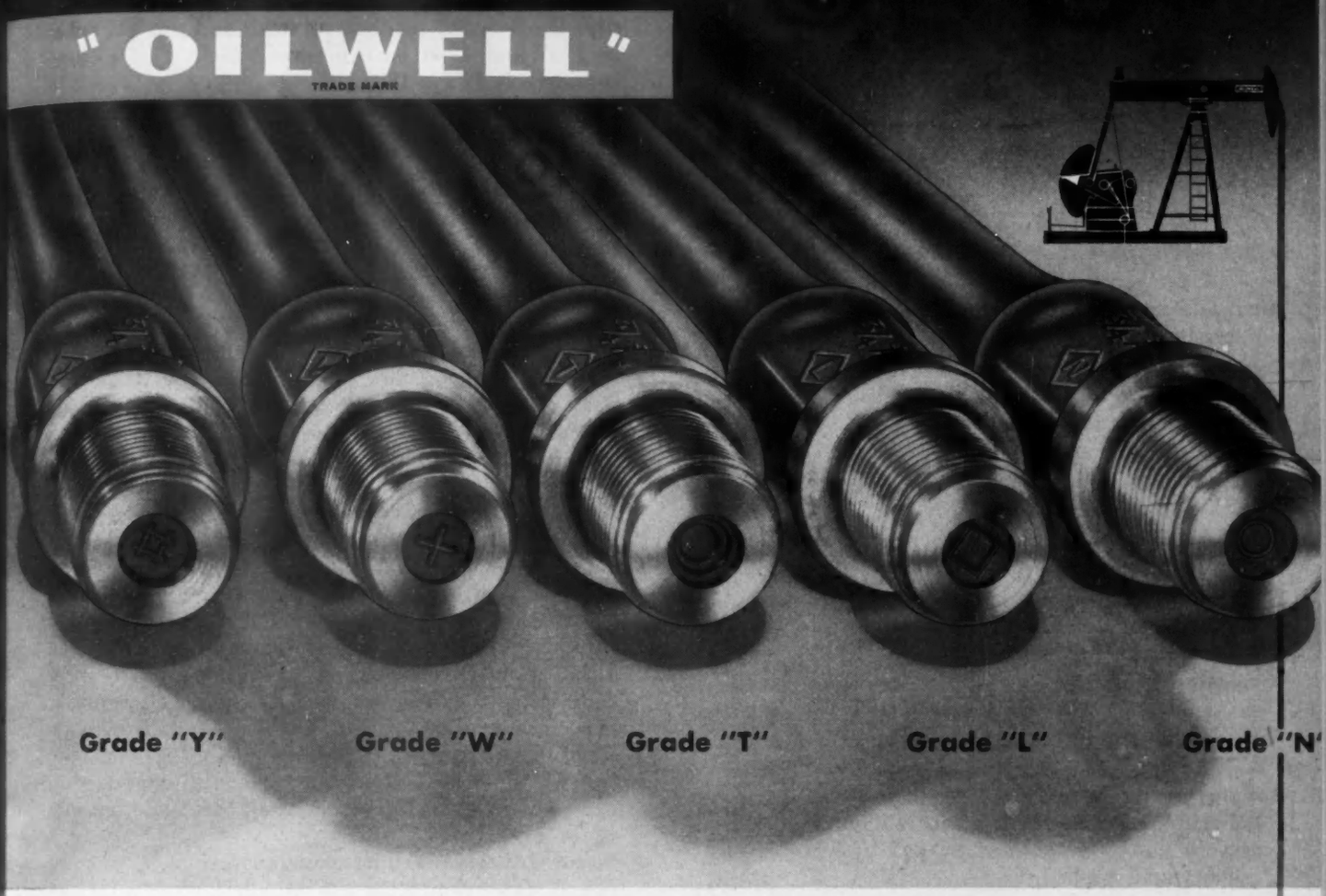


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*a Quick Look at this issue . . .*

# What's happening around the world

**Alaska:** Finding of first commercial production increases interest (Page 147).

**Canada:** Numerous new oil and gas strikes further enhance western Canada, despite curtailed drilling due to surplus production (Page 136).

**Mexico:** Exploratory drilling is on the increase—108 wildcats were completed in 1957, compared with 88 in 1956 (Page 149).

**Cuba:** Daily production expected to drop this year, despite relatively heavy drilling activity (Page 151).

**Trinidad:** Well completions increased 19.8 percent in 1957 to a total of 314. Four successful completions in new Inniss field (Page 152).

**Argentina:** Some foreign financial obligations have been eased in effort to bring supply in line with demand. Hopes are that 100 rigs will be in operation by end of 1958 (Page 153).

**Bolivia:** Attractive new oil legislation will speed up Bolivian oil development. Ten million acres of concessions had been granted by end of 1957, with 10 million more applied for (Page 155).

**Brazil:** Government has budgeted $200 million for exploration in 1958, after doubling production rate in 1957 (Page 156).

**Colombia:** Increased exploratory activity in the Sinu-Bolivar Basin and Caribbean coast (Page 158).

**Ecuador:** Continued high taxes brought drilling activity to standstill by mid-1958 (Page 160).

**Paraguay:** Leasing activity is on the upswing (Page 160).

**Peru:** Undeveloped prospects on coastal strip north of Lobitos will reactivate drilling activity in 1958 (Page 161).

**Venezuela:** Continued rapid development of country's oil potential is expected in 1958. Highlights of 1957 activity: First Gulf of Paria discovery on Venezuela side—several important "strikes" in "golden lane" of Lake Maracaibo—new concession grants totaled 2 million acres by August, 1957 (Page 162).

**Austria:** Decline of old fields, plus heavy burden of oil deliveries to Russia have stepped up exploratory activity (Page 172).

**France:** Oil outlook is improving. Reasons: Development of Parentis and Lugos fields—encouraging wildcat discovery in Paris Basin—important strikes in French Union (Page 174).

**West Germany:** Heavy drilling activity continues to find new fields and to boost production (Page 176).

**Italy:** Oil activity is increasing. New oil law resulted in 7.5 percent production increase last year (Page 179).

**Sicily:** Discovery of two new oil fields and two gas fields in 1957 and 1958 have improved Sicily's oil picture considerably (Page 180).

**The Netherlands:** Important new oil discoveries in western Holland helped boost production nearly 40 percent last year (Page 181).

**Russia and Satellites:** Russia exceeded its crude production goals in 1956 and 1957—increased total 40 percent to 802 million barrels last year.

**East Germany** plans to step up exploration activity—Albania had largest production increase of all satellite nations—other satellites are barely able to hold their own in meeting production quotas (Pages 183-192).

**Algeria:** Although politics still clouds country's oil future, recent discovery of major oil and gas fields in Sahara will boost activity during 1958 (Page 193).

**Egypt:** Egypt is well on its way toward self sufficiency in oil production. Further development of Belayim field more than tripled production last year (Page 199).

**Other Africa:** Exploratory drilling is moving at a record pace in Morocco, Tunisia, Libya, Angola and French Equatorial Africa. Esso Standard found Libya's first oil discovery in the Fezzan (Pages 200-207).

**Iran:** Enacted new law in July, 1957, opening tracts in highly prospective hinterlands and submerged Persian Gulf areas to foreign capital. Ahwaz 6, after major blowout, came in as first wildcat in South Iran since 1938 (Page 208).

**Kuwait:** Raudhatain field was extended considerably during first part of 1958, proving another major reserve (Page 230).

**Neutral Zone:** Interesting new Japanese pact, completion of more wells than any Middle East country last year, and major extension of Wafra field point to another active year in 1958 (Page 236).

**Saudi Arabia:** Reserve potential has been increased considerably by major new field discoveries at Khurais 150 miles inland, at Manifa in the Persian Gulf, a wildcat discovery 12 miles north of the Ghawar field and by the establishment of Permian beds at Damman (Page 244).

**Turkey:** Exploratory activity moving ahead rapidly by mid-1958 (Page 252).

**Other Middle East:** Confirmation of oil at Marmul in Dhofar and major extensions of Syria's Karatchok oil field highlighted activity in 1957 and first half of 1958. Accelerated exploration activity is expected in these countries, also in Jordan and Lebanon (Page 269).

**Burma:** First test at Kyaiklat on Irrwaddy River delta will be drilled in 1958 (Page 275).

**India:** Upped its production 9,335 barrels daily (18.8 percent) last year. Assam fields continue to show great promise with nine successes and one marginal out of 13 well completions in 1957 (Page 278).

**Indonesia and British Borneo:** Exploration virtually shut down in Indonesia awaiting clarification of terms under which new concessions will be granted. Search for oil in North Borneo continues, with no production as yet (Page 284).

**Japan:** Began offshore drilling this year—completed 34 field wildcats in 1957 for five producers and two gas wells (Page 288).

**Pakistan:** Exploratory activity gaining momentum in 1958 as drilling programs move into high gear and more private firms are given concessions (Page 292).

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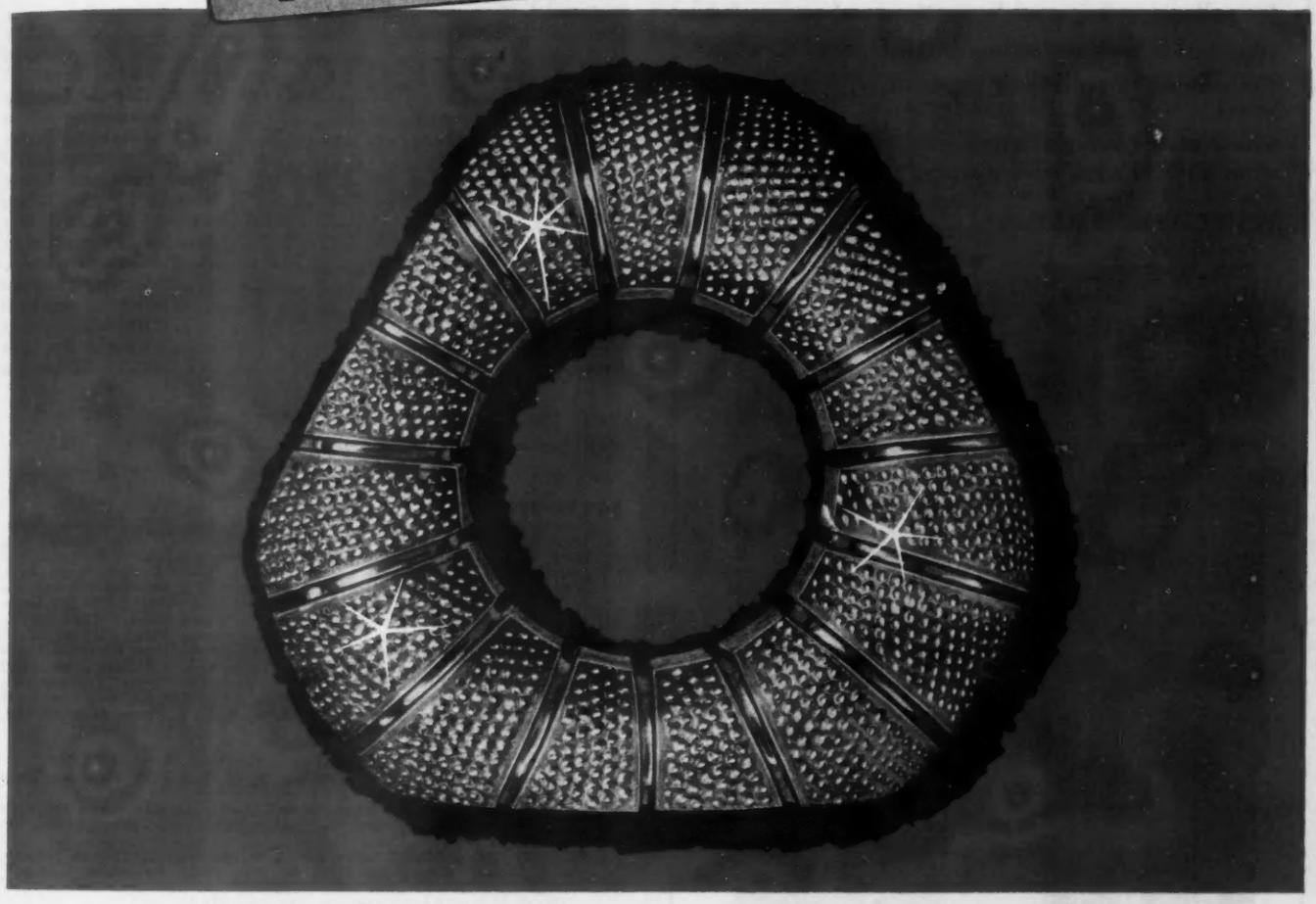

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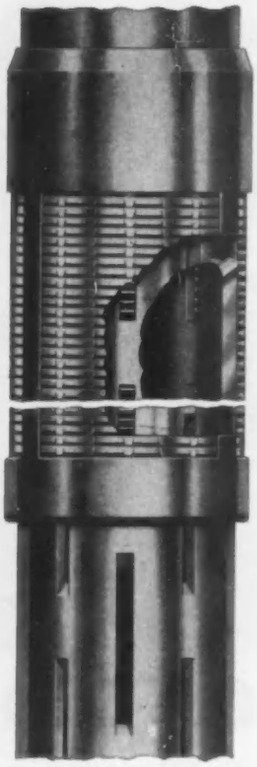

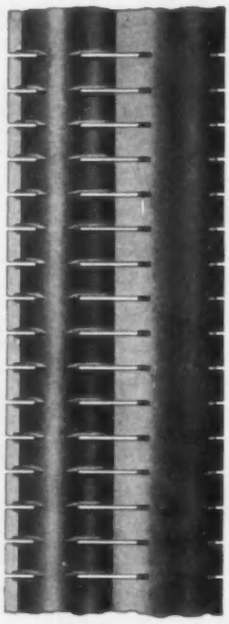

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Single copies 50 cents (except special issues). Double prices for single copies more than one year old. Subscription price: domestic and foreign, $2 a year.

WORLD OIL published every month except semi-monthly in February and August.


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PIPE LINE INDUSTRY and THE PIPE LINE COMPOSITE CATALOG for the oil and gas pipe line industry.

***Indexed by Industrial Arts Index and Engineering Index***

# New concession concepts are taking root

FUTURE OIL CONCESSION AGREEMENTS outside the United States and Canada are likely to provide for greater direct government participation as well as being more expensive. Many factors are combining to form circumstances which indicate such patterns probably will be followed to an increasing extent.

Keener competition for concessions is one of these factors. Another is the surge in nationalism, which embodies an increasing desire on the part of all peoples for greater active direct participation along with a larger share of the profits.

COMPETITION IS INCREASING because of two factors. The number of oil companies engaged in activity outside their native country has increased many times in recent years. This is especially true of American companies, a growing number of which are looking elsewhere because it has become very difficult and expensive to find oil in the U. S.

Competition also is intensified because the wave of concessions in late years has greatly reduced the acreage not covered by commitments.

Increased competition and higher prices were exemplified by the large number of bidders for Venezuela acreage in 1957 and 1958, and by the high prices paid for some concessions. Bidding for Iranian and other Persian Gulf areas in 1958 is another example.

These developments greatly strengthen the bargaining position of countries, especially those fortunate enough to have favorable oil areas not yet committed to concessions.

RECENT CONCESSION AGREEMENTS, particularly in the Middle East, have provided for greater direct government participation in oil operations.

Pan American Petroleum Corporation's recently acquired concession covering Iranian waters in the Persian Gulf is a joint 50-50 partnership venture with the Iranian government-owned National Iranian Oil Company (NIOC). The board chairman is to be nominated by NIOC, the vice chairman and managing director by Pan American. A $25-million bonus was paid for the concession, plus agreeing to spend $82 million on exploration work within 12 years.

Then, there is the agreement covering Persian Gulf offshore waters of the Neutral Zone owned jointly by Saudi Arabia and Kuwait. It provides for one-sixth of the board to be Saudis and equal representation of the Kuwait government. Many functions, such as pricing of oil products, are subject to the Saudi government's approval.

The Neutral Zone contract raises speculation whether the 50-50 split of profits between oil concessionaires and the governments soon may be outdated. Saudi Arabia will receive 56 percent of the profits from its half interest, and, reportedly, Kuwait will receive 57 percent from its half interest. However, this was a rich oil plum, and may not be indicative of most concessions. The area extends within 30 miles of the Burgan-Magwa-Admadi field, most prolific in the world. The Safaniya field, world's largest offshore field, may extend into the area.

There also is an increasing tendency for governments to demand greater "fringe" benefits. These may be in many forms, ranging from assistance in improving health, to agriculture programs, development of water supplies, etc.

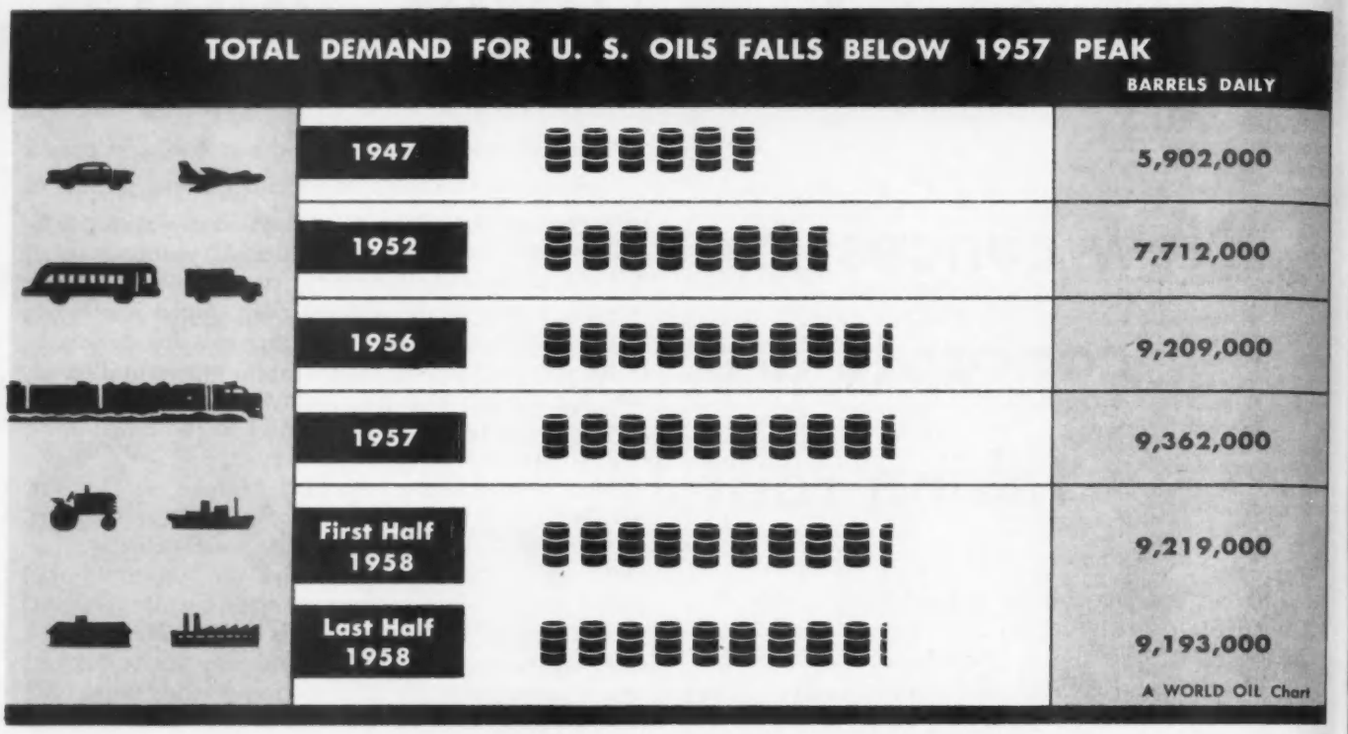
THE PATTERN FOR FUTURE concession agreements are being set by these new types of contracts.

It is to be sincerely hoped that government leaders do not become too greedy because of their improved bargaining positions. They should be cautious not to erect insurmountable barriers to the influx of risk venture capital. These governments must compete against each other for the limited amount of risk capital available from private companies. Intelligent leadership will be that which does not make unreasonable demands.

Government leaders also must realize the need for each country to have fully qualified oil personnel before attempting to take a really active part in actual oil operations.

The oil industry, even though it does not like it, probably faces an increasing degree of government participation. But, this may have its benefits as well as drawbacks. For one thing, governments may come to have a better understanding of the many peculiar and hazardous problems which confront oil men. Government partnership with private capital also may be helpful in causing some nations to spurn nationalization of oil, and even to turn from Communism.

Warren L. Baker




# Outlook is improving for U. S. demand

## Fourth quarter increase of 3 percent is anticipated.

TOTAL DEMAND for all oil supplied by the U. S. petroleum industry in 1958 will average about 9,206,000 barrels daily, it is estimated by WORLD OIL. That would be a decrease of 156,000 barrles daily or 1.7 percent from 1957.

The decrease will be unusual. The demand normally increases every year. The customary increase averages 4 to 5 percent annually.

While 1958 as a whole will show a decrease from 1957, the demand has been varying widely from last year's trend, as shown in an accompanying table. It was off sharply in the first quarter, remained similarly low in April, was down less in May, and showed a small increase in June. For the third quarter, a slight increase is promised. For the fourth quarter, a better gain of possibly over 3 percent is reasonable to expect.

**First Quarter.** In the first quarter of 1958, the demand was down sharply from 1957 by the large amount of 728,000 barrels daily, or 6.9 percent, in averaging 9,986,000 barrels per day. The drop was caused in the first place by sharply reduced exports. They were normal this year but abnormally high early last year, because of the Suez canal closing. In this year's first quarter, domestic consumption also was lower than in the previous year because of the business recession.

Total demand was off 1,246,000 barrels daily, or 10.9 percent, in January, 1958. It temporarily recovered in February to a level slightly above last year. But in March it was again down sharply by 957,000 barrels daily, or 9.5 percent.

**Second Quarter.** In the second quarter of 1958, total demand for all oils averaged about 8,550,000 barrels daily. It was down only 238,000 barrels daily, or 2.7 percent, from 1957. That better comparison reflected reopening of the Suez canal in the second quarter of 1957 and the resultant reduction of U. S. oil exports toward normal levels. However, domestic consumption of oils in the U. S. continued to lag in this year's second quarter. The total demand consequently remained considerably under 1957 for the second quarter.

The trend improved, however, as the quarter progressed. Demand was down from 1957 in April by 738,000 barrels daily, or 7.8 percent, in averaging 8,694,000 barrels per day. It was down in May by only 156,000 barrels daily, or 1.8 percent. In June, 1958, the demand rose above June, 1957, by 176,000 barrels daily, or 2.1 percent. That was the best showing of the year up to that time.

**First Half.** Despite the gradually improving trend in the second quarter, total demand for all oils in the first half of 1958 was 482,000 barrels daily, or 5.0 percent below 1957, averaging 9,219,000 barrels per day.

**Third Quarter.** Demand continued good in July, 1958. For the third

quarter, it is expected to equal or slightly exceed last year. Exports will continue low. But domestic consumption gradually is improving. Also last year's third quarter brought the beginning of the decline in domestic oil demand. Henceforth, it will be easier to equal last year's trend.

**Fourth Quarter.** Total demand in the fourth quarter is expected to be considerably above 1957. The increase will reflect recovery from the business recession, which already had depressed oil use in last year's fourth quarter. Total demand in this year's final quarter is here forecast at 9,766,000 barrels daily, up 304,000 barrels or 3.2 per cent from the like period last year.

**Second Half.** On the basis of the above estimates for the third and fourth quarters, total demand for all oils in the second half of 1958 will average about 9,193,000 barrels daily. That is an increase of 165,000 barrels, or 1.8 percent, over last year's second half.

**Supply Being Increased.** Supplies of oils have been successfully balanced with the changing volumes of demand. U. S. crude oil production was progressively reduced, as demand decreased, in 1957 and the first half of 1958. It was at its lowest levels of recent years in April, May and June. But it was increased a little in July and substantially more in August, as demand for crude grew stronger. For September and ensuing months, even higher crude production is due to be required.

Imports of oils also have been adjusted to the trends of demand. They have been restricted since last fall through the government sponsored voluntary import program, which continues in effect.

### Total Domestic and Export Demand for U. S. Oils

(Thousands of Barrels Daily)

| MONTH | 1958 | 1957 | Percent Change | PERIOD | 1958 | 1957 | Percent Change |
|---|---|---|---|---|---|---|---|
| January | 10,158 | 11,404 | —10.9 | First Quarter | 9,896 | 10,624 | — 6.9 |
| February | 10,510 | 10,413 | + 0.9 | Second Quarter | 8,550* | 8,788 | — 2.7 |
| March | 9,079 | 10,036 | — 9.5 | First Half | 9,219* | 9,701 | — 5.0 |
| April | 8,694 | 9,432 | — 7.8 | Third Quarter | 8,620† | 8,594 | + 0.3 |
| May | 8,387* | 8,543 | — 1.8 | Fourth Quarter | 9,766† | 9,462 | + 3.2 |
| June | 8,573* | 8,397 | + 2.1 | Second Half | 9,193† | 9,028 | + 1.8 |
| First Half | 9,219 | 9,701 | — 5.0 | Total, Year | 9,206† | 9,362 | — 1.7 |

* Estimate. † Forecast.

### U. S. Stocks of Major Refined Products at Mid-Year (End of June), 1957 and 1958 by Refining Districts

(Sources: 1957 from Bureau of Mines; 1958 from A.P.I.)

(Thousands of Barrels)

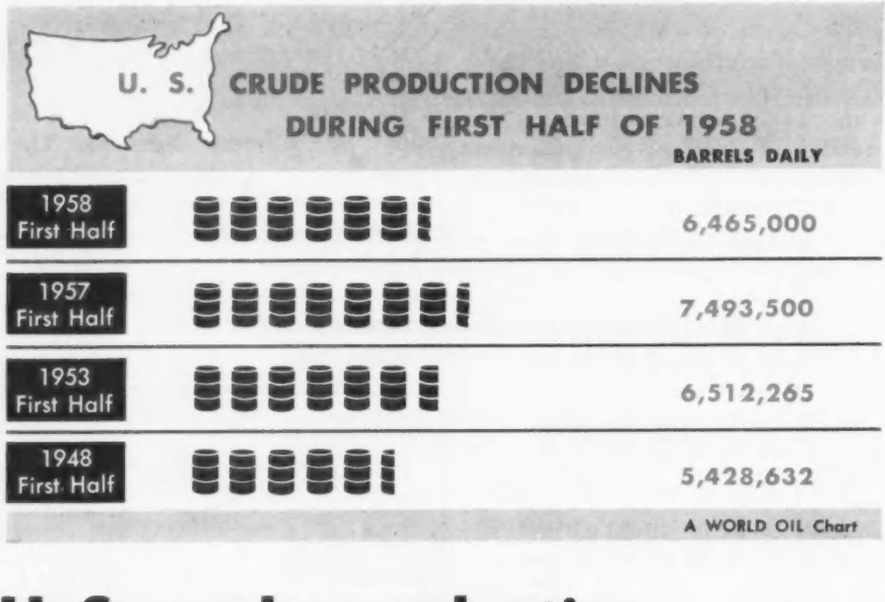
| DISTRICT | GASOLINE | | | KEROSINE | | | DISTILLATE FUEL OIL | | | RESIDUAL FUEL OIL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1957 | 1958 | Percent Diff. | 1957 | 1958 | Percent Diff. | 1957 | 1958 | Percent Diff. | 1957 | 1958 | Percent Diff. |
| East Coast | 43,291 | 43,346 | + 0.1 | 12,934 | 9,419 | —27.2 | 58,855 | 34,003 | —42.2 | 13,312 | 13,184 | — 1.0 |
| Appalachian No. 1 | 4,985 | 4,804 | — 3.6 | 644 | 533 | —17.2 | 3,140 | 2,241 | —28 6 | 722 | 568 | —21.3 |
| Appalachian No. 2 | 2,739 | 2,507 | — 8.5 | 454 | 493 | + 8.6 | 1,178 | 1,058 | —10.2 | 469 | 317 | —32.4 |
| Ind., Ill., Ky. | 34,393 | 34,253 | — 0.4 | 6,348 | 5,201 | —18.1 | 20,241 | 17,624 | —12.9 | 5,905 | 5,191 | —12.1 |
| Minn., Wis., N. & S.D. | 7,033 | 7,124 | + 1.3 | 1,146 | 1,183 | + 3.2 | 7,159 | 5,395 | —24.7 | 494 | 576 | +16.6 |
| Okla., Kans., Mo. | 17,184 | 16,341 | — 4.9 | 1,204 | 1,393 | +15.7 | 10,999 | 9,778 | —11.1 | 1,327 | 938 | —29.3 |
| Inland Texas | 7,464 | 6,507 | —12.8 | 490 | 297 | —39.4 | 2,023 | 1,634 | —19.2 | 2,153 | 2,091 | — 2.9 |
| Texas Gulf Coast | 27,117 | 22,691 | —16.3 | 2,707 | 2,686 | — 0.8 | 17,523 | 10,506 | —40.1 | 6,138 | 6,517 | + 6.2 |
| La. Gulf Coast | 12,255 | 9,508 | —22.4 | 1,765 | 1,563 | —11.5 | 7,125 | 4,869 | —31.7 | 1,515 | 1,551 | + 2.4 |
| N. La. & Ark. | 5,006 | 4,613 | — 7.9 | 795 | 752 | — 5.4 | 2,093 | 2,028 | — 3.1 | 232 | 155 | —33.2 |
| New Mexico | 426 | 612 | —30.4 | 14 | 20 | +42.9 | 147 | 139 | — 5.5 | 97 | 67 | —30.9 |
| Other Rocky Mt. | 6,431 | 6,365 | — 1.0 | 340 | 252 | —25.9 | 2,897 | 2,810 | — 3.0 | 987 | 954 | — 3.4 |
| West Coast | 28,452 | 26,057 | — 8.4 | 359 | 391 | + 8.9 | 16,069 | 13,114 | —18.4 | 26,608 | 32,202 | +21.0 |
| Total U. S. | 196,776 | 184,727 | — 6.1 | 29,200 | 24,197 | —17.1 | 149,449 | 105,192 | —29.6 | 59,959 | 64,311 | + 7.3 |

### U. S. Crude Oil Stocks, by Grades, at Mid-Year, 1957 and 1958

(Thousands of Barrels)

| GRADE | June 29, 1957 | June 28, 1958 | Change |
|---|---|---|---|
| **Pennsylvania Grade** | **2,812** | **2,887** | **75** |
| **Other Appalachian** | **1,749** | **1,358** | **— 391** |
| **Lima-Michigan** | **825** | **1,014** | **189** |
| **Illinois-Indiana** | **9,033** | **10,320** | **1,287** |
| **Arkansas** | **2,748** | **2,323** | **— 425** |
| **Kansas** | **10,896** | **10,345** | **— 551** |
| **Nebraska-North Dakota** | **2,568** | **2,096** | **— 472** |
| **Louisiana** | **18,249** | **16,030** | **— 2,219** |
| North Louisiana | 2,727 | 2,867 | 140 |
| Gulf Louisiana | 15,522 | 13,163 | — 2,359 |
| **Mississippi, Alabama & Florida** | **3,110** | **2,050** | **— 1,060** |
| **New Mexico** | **7,615** | **6,529** | **— 1,086** |
| **Oklahoma** | **21,700** | **17,024** | **— 4,676** |
| **Texas** | **128,858** | **106,623** | **— 22,235** |
| East Texas Proper | 11,613 | 7,385 | — 4,228 |
| West Texas | 60,555 | 50,292 | — 10,263 |
| Gulf Coast | 24,579 | 21,189 | — 3,390 |
| Other Texas | 32,111 | 27,757 | — 4,354 |
| Panhandle | 2,842 | 2,446 | — 396 |
| North Texas | 8,309 | 11,970 | 3,661 |
| South Texas | 5,061 | 5,977 | 916 |
| Rest of Texas | 15,899 | 7,364 | — 8,535 |
| **Wyoming** | **17,868** | **15,863** | **— 2,005** |
| **Other Rocky Mountain** | **6,030** | **8,248** | **2,218** |
| **California** | **27,702** | **39,438** | **11,736** |
| **Total Domestic** | **261,763** | **242,148** | **— 19,615** |
| **Foreign** | **15,520** | **15,972** | **452** |
| In California | 2,876 | 5,340 | 2,464 |
| Other Foreign | 12,644 | 10,632 | — 2,012 |
| **Total in United States** | **277,283** | **258,120** | **— 19,163** |

Source: U. S. Bureau of Mines.




# U. S. crude production . . . Higher

## producing rates indicated for last half of 1958.

A WELCOME relief lies immediately ahead for hard-pressed U. S. crude producers as decidely higher domestic producing rates for the remainder of the year appeared certain. Two primary factors which emerged at mid-year pointed to this general improvement within the oil industry:

1. Plummeting oil stocks. A major reduction in U. S. oil inventories during recent months has resulted from drastic cuts in production and refinery output of products, in addition to the government's restrictions which have held in check the growth of oil imports.

2. Improved demand. Although the industry oil consumption normally climbs steadily month by month from the low levels of spring to seasonal peaks in winter months, another factor pointing toward general improvement has been discerned. Domestic oil consuming rates are showing signs of expanding.

Domestic consumption has exceeded the corresponding period of 1957 during the past two months, and the outlook is for larger consumption during the last half of 1958 than during 1957.

During June, demand rose 1.8 percent and represented the best gain in almost a year. In commenting on this brightening aspect of the U. S. oil industry, John G. Winger, economics consultant, The Chase Manhattan Bank, New York, said in late July:

"The numbers which measure demand for petroleum in June provide the most encouraging reading experienced in several months. (This increase in demand) marked the first time total demand (which includes exports) has shown an increase over a year ago since last February when extremely cold weather induced a heavy flow of heating oils . . ."

Pointing out another noteworthy performance, Winger reported that, although the margin was narrow, the volume of oil consumed domestically during the first half of the year was at an all-time high, despite the general business recession and the experience of other basic industries.

The initial move toward substantially higher producing rates in the U. S. during the last half of 1958 occurred in July, with an additional gain already assured by August allowables. And it is anticipated that additional increases in crude oil producing rates lie further ahead.

U. S. crude oil production may be as much as a million barrels a day larger by December of this year than during the spring months, when it averaged only 6⅓ million barrels per day.

Prospects, too, are good that production during the closing months of 1958 will exceed rates existing during the last quarter of 1957.

With the correction in recent months of the economic difficulties which hampered the U. S. oil industry since the spring of last year, the outlook appears greatly improved for other phases of the industry.

As oil producing rates expand, increased drilling activity during the last half of 1958 also can be expected (See Page 120. More satisfactory producing rates also will provide domestic oil producers with the funds and the incentive to drill a greater number of wells and to keep older wells in better repair.

**Stocks.** More than 20 million barrels of crude oil have been taken from stocks since the end of March. Inventories now are 24 million barrels less than a year ago, whereas they had been almost 24 million barrels greater on March 31. All the reduction has occurred outside California. For example:

• Gasoline stocks in mid-July were identical with 12 months before, although they had been 12 million barrels greater on March 31. Almost all of the change has occurred outside of California. Current inventories of motor fuel are 36 million barrels less than at the end of March.

• Distillate fuel oil stocks are 40 million barrels less than on January 1. At their mid-July level they were 16 million barrels less than at the corresponding period of 1957, although they had been 21 million barrels larger than the level reported at the end of January of the previous year.

As a result of dwindling inventories, indicated August production rates will be about 400,000 barrels a day higher than in June. Most of the increase will come from Texas, which will be producing 11 days in August compared with only 8 days in April, May and June and 9 days in July.

Texas crude oil production in August likely will average slightly more than 2½ million barrels daily. This would be a quarter of a million barrels more than in June of this year and only a quarter of a million barrels below August, 1957, volumes.

The Texas Railroad Commission

## U. S. CRUDE OIL PRODUCTION, BY STATES AND DISTRICTS, JUNE AND FIRST HALF OF YEAR, 1957 AND 1958

From U. S. Bureau of Mines except May and June, 1958, from A. P. I. weekly reports, and breakdown of Texas by Districts from A. P. I.

(Thousands of Barrels)

| State or District | JUNE Total 1957 | JUNE Total 1958 | JUNE % Diff. | JUNE Daily Average 1957 | JUNE Daily Average 1958 | FIRST HALF OF YEAR Total 1957 | FIRST HALF OF YEAR Total 1958 | FIRST HALF OF YEAR Daily Average 1957 | FIRST HALF OF YEAR Daily Average 1958 | FIRST HALF OF YEAR % Diff. | % of U.S. in 1958 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Alabama** | 488 | 478 | — 2.1 | 16.3 | 15.9 | 2,520 | 2,867 | 13.9 | 15.8 | + 13.7 | 0.2 |
| **Arkansas** | 2,483 | 2,263 | — 8.9 | 82.8 | 75.4 | 15,392 | 14,491 | 85.1 | 80.1 | — 5.9 | 1.2 |
| **California** | 27,749 | 25,504 | — 8.1 | 925.0 | 850.1 | 168,614 | 158,007 | 931.6 | 873.0 | — 6.3 | 13.5 |
| **Colorado** | 4,399 | 3,962 | — 9.9 | 146.6 | 132.1 | 28,015 | 24,667 | 154.8 | 136.3 | — 12.0 | 2.1 |
| **Florida** | 36 | 38 | + 5.6 | 1.2 | 1.3 | 228 | 223 | 1.3 | 1.2 | — 7.7 | 0.0 |
| **Illinois** | 5,267 | 6,817 | + 29.4 | 175.5 | 227.2 | 38,265 | 40,464 | 211.4 | 223.6 | + 5.8 | 3.4 |
| **Indiana** | 1,045 | 944 | — 9.7 | 34.8 | 31.5 | 6,556 | 5,704 | 36.2 | 31.5 | — 13.0 | 0.5 |
| **Kansas** | 9,999 | 9,662 | — 3.4 | 333.3 | 322.1 | 60,046 | 57,306 | 331.7 | 316.6 | — 4.6 | 4.9 |
| **Kentucky** | 1,364 | 1,300 | — 4.7 | 45.5 | 43.3 | 8,378 | 7,776 | 46.3 | 43.0 | — 7.1 | 0.7 |
| **Louisiana** | 24,896 | 24,403 | — 2.0 | 829.9 | 813.4 | 173,861 | 149,223 | 960.6 | 824.4 | — 14.2 | 12.8 |
| North Louisiana | 3,850 | 3,380 | — 12.2 | 128.3 | 112.6 | 24,523 | 20,603 | 135.5 | 113.8 | — 16.0 | 1.8 |
| South Louisiana | 21,046 | 21,023 | — 0.1 | 701.6 | 700.8 | 149,338 | 128,620 | 825.1 | 710.1 | — 13.9 | 11.0 |
| **Michigan** | 822 | 750 | — 8.8 | 27.4 | 25.0 | 5,124 | 4,609 | 28.3 | 25.5 | — 9.9 | 0.4 |
| **Mississippi** | 3,236 | 2,934 | — 9.3 | 107.8 | 97.8 | 20,492 | 17,983 | 113.2 | 99.4 | — 12.2 | 1.5 |
| **Montana** | 2,273 | 2,352 | + 3.5 | 75.7 | 78.4 | 13,081 | 13,719 | 72.3 | 75.8 | + 4.8 | 1.2 |
| **Nebraska** | 1,505 | 1,625 | + 8.0 | 50.2 | 54.2 | 9,024 | 9,559 | 49.9 | 52.8 | + 5.8 | 0.8 |
| **Nevada** | 3 | 3 | ..... | 0.1 | 0.1 | 15 | 17 | 0.1 | 0.1 | ..... | 0.0 |
| **New Mexico** | 7,453 | 8,501 | + 14.1 | 248.4 | 283.4 | 47,291 | 47,924 | 261.3 | 264.8 | + 1.3 | 4.1 |
| Southeast New Mexico | 7,284 | 7,451 | + 2.3 | 242.8 | 248.4 | 46,211 | 44,896 | 255.3 | 248.0 | — 2.9 | 3.8 |
| Northwest N. Mexico | 169 | 1,050 | +521.3 | 5.6 | 35.0 | 1,080 | 3,028 | 6.0 | 16,7 | +178.3 | 0.3 |
| **New York** | 215 | 173 | — 19.5 | 7.2 | 5.8 | 1,345 | 1,160 | 7.4 | 6.4 | — 13.5 | 0.1 |
| **North Dakota** | 1,199 | 1,152 | — 3.9 | 40.0 | 38.4 | 7,158 | 7,045 | 39.5 | 38.9 | — 1.5 | 0.6 |
| **Ohio** | 413 | 524 | + 26.9 | 13.8 | 17.5 | 2,487 | 3,120 | 13.7 | 17.2 | + 25.5 | 0.3 |
| **Oklahoma** | 16,423 | 16,029 | — 2.4 | 547.4 | 534.3 | 110,898 | 99,196 | 612.7 | 548.0 | — 10.6 | 8.5 |
| **Pennsylvania** | 680 | 536 | — 21.2 | 22.6 | 17.9 | 4,177 | 3,416 | 23.1 | 18.9 | — 18.2 | 0.3 |
| **Texas*** | 92,498 | 68,390 | — 26.1 | 3,083.3 | 2,278.7 | 577,616 | 438,954 | 3,191.2 | 2,425.2 | — 24.0 | 37.5 |
| Dist. 1: South Central | 1,615 | 1,373 | — 15.0 | 53.8 | 45.8 | 10,186 | 8,322 | 56.3 | 46.0 | — 18.3 | 0.7 |
| Dist. 2: Middle Gulf | 4,525 | 2,962 | — 34.6 | 150.8 | 98.7 | 28,900 | 19,663 | 159.7 | 108.6 | — 32.0 | 1.7 |
| Dist. 3: Upper Gulf | 13,726 | 10,410 | — 24.2 | 457.5 | 347.0 | 84,510 | 66,686 | 466.9 | 368.4 | — 21.1 | 5.7 |
| Dist. 4: L. Gulf-S.W. | 6,994 | 5,155 | — 26.3 | 233.1 | 171.8 | 44,077 | 32,341 | 243.5 | 178.7 | — 26.6 | 2.8 |
| Dist. 5: East Central | 1,199 | 776 | — 35.3 | 40.0 | 25.9 | 7,523 | 5,254 | 41.6 | 29.0 | — 30.3 | 0.5 |
| Dist. 6: Northeast | 10,157 | 6,602 | — 35.0 | 338.6 | 220.1 | 64,136 | 43,993 | 354.3 | 243.1 | — 31.4 | 3.8 |
| Dist. 7-B: N. Central | 4,977 | 3,671 | — 26.3 | 165.9 | 122.4 | 30,204 | 24,079 | 166.9 | 133.0 | — 20.3 | 2.1 |
| Dist. 7-C: W. Central | 4,935 | 3,641 | — 26.2 | 164.5 | 121.4 | 31,300 | 23,011 | 172.9 | 127.1 | — 26.5 | 2.0 |
| Dist. 8: West | 34,821 | 24,781 | — 28.8 | 1,160.7 | 826.0 | 214,170 | 156,955 | 1,183.3 | 867.2 | — 27.0 | 13.4 |
| Dist. 9: North | 6,379 | 5,795 | — 9.2 | 212.6 | 193.2 | 38,771 | 35,169 | 214.2 | 194.3 | — 9.3 | 3.0 |
| Dist. 10: Panhandle | 3,580 | 3,194 | — 10.8 | 119.3 | 106.4 | 19,928 | 19,332 | 110.1 | 106.8 | — 3.0 | 1.7 |
| **Utah** | 264 | 2,492 | +843.8 | 8.8 | 83.1 | 1,803 | 7,109 | 10.0 | 39.3 | +293.0 | 0.6 |
| **Virginia** | 1 | ..... | —100.0 | ..... | ..... | 3 | 2 | .... | .... | ..... | 0.0 |
| **West Virginia** | 173 | 186 | + 7.5 | 5.8 | 6.2 | 1,074 | 1,090 | 5.9 | 6.0 | + 1.7 | 0.1 |
| **Wyoming** | 8,312 | 9,059 | + 9.0 | 277.1 | 301.9 | 52,814 | 54,524 | 291.8 | 301.2 | + 3.2 | 4.7 |
| **Others†** | 6 | 10 | + 66.7 | 0.2 | 0.3 | 45 | 68 | 0.2 | 0.4 | +100.0 | 0.0 |
| **Total U. S.** | 213,202 | 190,057 | — 10.9 | 7,106.7 | 6,335.2 | 1,356,322 | 1,170,223 | 7,493.5 | 6,465.0 | — 13.7 | 100.0 |

* Data for Texas in first half of year by districts are from A.P.I. and do not agree with Texas Total, which is from Bureau of Mines except May and June, 1958 from A.P.I.

† Includes Missouri, South Dakota and Tennessee.

raised the state's allowables on the basis of conclusive evidence of expanding market demand.

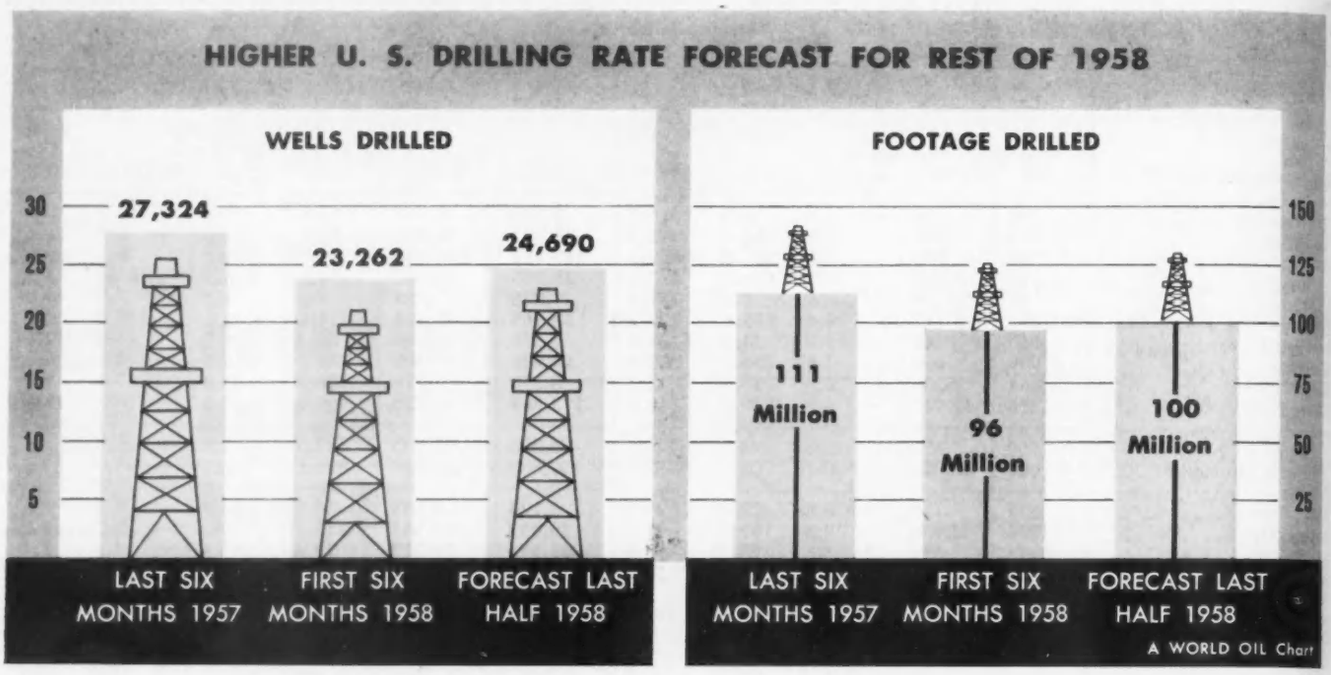
According to the forecast of the Independent Petroleum Association of America, total U. S. petroleum demand in the third quarter of this year will approximate the level recorded during the like period of 1957.

In the first five months of the current year, IPAA said, total demand was down 5.9 percent from the previous years, with domestic consumption about unchanged at 8,250,000 barrels daily and with exports down 66 percent to 270,000 barrels daily from the Suez crisis period.

The market for domestic crude will increase in the third quarter to about 7 million barrels daily average, IPAA estimated. Again, of course, the increase will result from current low crude stocks and mounting demand.

As a result of the improvement in demand, prospects also were bright for a firm price situation.

**Comparison.** While daily average U. S. crude production during the first half of 1958 (6,465,000 barrels) amounted to a decline of slightly more than 1 million barrels from the corresponding period of 1957, it was almost equal to the daily rate recorded in the first half of 1953. The 1958 level for this period was slightly greater than a million barrels more than the corresponding producing rate of 1948.




# Gain in drilling forecast for U. S.

**Completion of 6.1 percent more wells and 4.0 percent more footage in last half of 1958 than in first six months is forecast by WORLD OIL.**

**By Warren L. Baker,** Editorial Director, World Oil

Higher U. S. drilling rates are expected to exist during the second half of 1958 than in the first six months. However, the increase will not be sufficient to return activity to the high levels of 1956 or early 1957.

On the basis of a midyear survey of oil company drilling plans, coupled with the belief that the substantially improved economic outlook for the U. S. oil industry will favorably influence drilling activity, World Oil forecasts the drilling of 24,690 wells and 100,314,200 feet of hole in the U. S. during the last half of 1958.

**Gains over first half.** This would represent an increase of 1,428 wells (6.1 percent) over the 23,262 wells completed during the first six months of 1958. But, such a drilling rate would still be 9.6 percent below second half 1957 rates and 16.2 percent below the corresponding months of 1956.

Footage forecast for the second half of 1958 would represent a gain of 3.8 million feet (4.0) percent compared with the first of the year. But, this volume would still be 9.8 percent less than the 111 million feet drilled during the second half of last year.

Such activity in the last half of the year would result in a total of 47,952 wells being drilled in the U. S. during the year 1958. This would be 10.2 percent below the 53,400 wells completed in 1957, and 17.9 percent less than the record 58,418 wells drilled in 1956.

Footage for the full 12 months of 1958 is seen as totaling 196,794,248 feet, 10.4 percent less than the 219,626,073 feet drilled in 1957, and 16.4 percent less than the record 235,386,709 feet drilled in 1956.

**Improved outlook.** Increased drilling activity in the last half of 1958 is predicted on the belief that U. S. oil producers will enjoy much more favorable economic conditions than in the first six months of year and on drilling plans from companies which account for a large portion of the drilling activity.

Many economic difficulties which hampered U. S. oil since the spring

**U. S. Drilling Prospects vs. Recent Rates**

| | 1958 Forecast | 1957 | 1956 | Percent Change 1958-1957 | Percent Change 1958-1956 |
|---|---|---|---|---|---|
| **Last Six Months:** | | | | | |
| Wells Drilled..... | 24,690 | 27,324 | 29,443 | — 9.6 | —16.2 |
| Footage Drilled... | 100,314,200 | 111,094,641 | 117,811,048 | — 9.8 | —14.9 |
| **First Six Months:** | | | | | |
| Wells Drilled..... | 23,262* | 26,076 | 28,975 | —10.8 | —19.7 |
| Footage Drilled... | 96,500,842* | 108,531,432 | 117,575,661 | —11.1 | —17.9 |
| **Twelve Months:** | | | | | |
| Wells Drilled..... | 47,952 | 53,400 | 58,418 | —10.2 | —17.9 |
| Footage Drilled... | 196,794,248 | 219,626,073 | 235,386,709 | —10.4 | —16.4 |

*Actual amount of wells and footage drilled in First Six Months of 1958.

## Forecast of U. S. Wells and Footage to Be Drilled in Last Six Months 1958 and in Year 1958

Forecast covers all new wells to be drilled for oil or gas in 1958, salt water disposal wells, and water or gas-input wells for repressuring and secondary recovery but does not estimate old wells drilled deeper. Number of wells and footage drilled first half 1958 and first half of 1957 appear in an accompanying table.

| STATE or DISTRICT | Forecast For Last Six Months 1958 | | Forecast For 12 Months 1958 | | Percent Change: Last Half 1958—First Half 1958 | | Percent Change: Year 1958 and Year 1957 | | Percent of U.S. Year 1958 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total New Wells | Footage of Total New Wells | Total New Wells | Footage of Total New Wells | Wells | Footage | Wells | Footage | Wells | Footage |
| Alabama | 35 | 306,100 | 73 | 638,408 | — 7.9 | — 7.9 | — 22.4 | — 19.2 | 0.1 | 0.3 |
| Arkansas | 335 | 1,162,400 | 665 | 2,307,562 | + 1.5 | + 1.5 | — 39.8 | — 31.6 | 1.4 | 1.2 |
| California | 625 | 2,917,500 | 1,373 | 6,409,188 | — 16.5 | — 16.5 | — 40.4 | — 35.3 | 2.9 | 3.3 |
| Colorado | 475 | 2,493,300 | 856 | 4,493,136 | + 24.7 | + 24.7 | + 5.0 | + 5.3 | 1.8 | 2.3 |
| Florida | 1 | 9,500 | 3 | 28,442 | — 50.0 | — 49.9 | — 66.7 | — 53.9 | 0.0 | 0.0 |
| Illinois | 1,220 | 2,803,600 | 2,238 | 5,142,578 | + 19.8 | + 19.9 | — 13.6 | — 13.3 | 4.7 | 2.6 |
| Indiana | 375 | 607,500 | 712 | 1,153,496 | + 11.3 | + 11.3 | — 0.8 | — 4.8 | 1.5 | 0.6 |
| Kansas | 2,010 | 6,908,400 | 3,693 | 12,692,467 | + 19.4 | + 19.4 | — 12.5 | — 15.4 | 7.7 | 6.4 |
| Kentucky | 900 | 1,278,900 | 1,561 | 2,218,255 | + 36.2 | + 36.1 | — 11.5 | — 12.7 | 3.3 | 1.1 |
| Louisiana | 1,680 | 13,184,800 | 3,335 | 26,833,384 | + 1.5 | — 3.4 | — 11.6 | — 9.8 | 6.9 | 13.6 |
| North Louisiana | 670 | 2,599,000 | 1,230 | 4,771,046 | + 19.6 | + 19.7 | — 14.2 | — 8.9 | 2.5 | 2.4 |
| South Louisiana | 1,010 | 10,585,800 | 2,105 | 22,062,338 | — 7.8 | — 7.8 | — 10.0 | — 10.0 | 4.4 | 11.2 |
| [1]Gulf of Mexico | 225 | 2,143,600 | 484 | 4,610,967 | — 13.1 | — 13.1 | — 25.3 | — 25.4 | 1.0 | 2.3 |
| Michigan | 210 | 611,700 | 389 | 1,133,094 | + 17.3 | + 17.3 | — 7.2 | — 3.1 | 0.8 | 0.6 |
| Mississippi | 205 | 1,813,800 | 382 | 3,379,964 | + 15.8 | + 16.6 | — 2.1 | + 16.6 | 0.8 | 1.7 |
| Missouri | 7 | 4,600 | 15 | 9,806 | — 12.5 | — 11.7 | + 50.0 | + 28.2 | 0.0 | 0.0 |
| Montana | 170 | 966,500 | 331 | 1,881,802 | + 5.6 | + 5.6 | — 32.7 | — 12.2 | 0.7 | 1.0 |
| Nebraska | 325 | 1,928,200 | 640 | 3,797,122 | + 3.2 | + 3.2 | — 28.3 | — 28.3 | 1.3 | 1.9 |
| New Mexico | 1,020 | 4,876,600 | 1,989 | 9,509,455 | + 5.3 | + 5.3 | — 9.3 | — 8.2 | 4.1 | 4.8 |
| New York | 210 | 323,000 | 498 | 765,800 | — 27.1 | — 27.1 | — 4.1 | — 5.9 | 1.0 | 0.4 |
| North Dakota | 215 | 1,470,000 | 411 | 2,810,037 | + 9.7 | + 9.7 | + 31.7 | + 32.5 | 0.9 | 1.4 |
| Ohio | 550 | 1,418,400 | 1,031 | 2,658,971 | + 14.3 | + 14.3 | + 2.0 | + 9.7 | 2.1 | 1.4 |
| Oklahoma | 4,110 | 12,913,600 | 7,759 | 24,377,607 | + 12.6 | + 12.6 | + 37.0 | + 25.5 | 16.2 | 12.4 |
| Pennsylvania | 285 | 642,700 | 569 | 1,283,188 | + 0.4 | + 0.3 | — 44.3 | — 51.6 | 1.2 | 0.7 |
| South Dakota | 2 | 11,300 | 5 | 28,291 | — 33.3 | — 33.5 | — 87.8 | — 79.9 | 0.0 | 0.0 |
| Texas | 8,700 | 37,574,800 | 17,451 | 75,355,169 | — 0.6 | — 0.6 | — 18.0 | — 16.4 | 36.4 | 38.3 |
| Dist. 1: South Central | 550 | 1,351,400 | 1,066 | 2,619,104 | + 6.6 | + 6.6 | — 15.1 | — 19.5 | 2.2 | 1.3 |
| Dist. 2: Middle Gulf | 340 | 2,057,700 | 701 | 4,242,304 | — 5.8 | — 5.8 | — 7.8 | — 7.9 | 1.4 | 2.2 |
| Dist. 3: Upper Gulf | 640 | 4,078,100 | 1,307 | 8,328,134 | — 4.1 | — 4.1 | — 20.5 | — 22.6 | 2.7 | 4.2 |
| Dist. 4: L. Gulf-S.W. | 720 | 3,692,200 | 1,329 | 6,815,331 | + 18.2 | + 18.2 | — 6.8 | — 9.5 | 2.8 | 3.5 |
| Dist. 5 & 6: East | 530 | 2,783,000 | 1,042 | 5,373,913 | + 3.5 | + 7.4 | — 16.6 | — 18.4 | 2.2 | 2.7 |
| Dist. 7-B & 9: North | 2,820 | 8,713,800 | 5,706 | 17,631,738 | — 2.3 | — 2.3 | — 21.9 | — 17.4 | 11.9 | 9.0 |
| Dist. 7-C & 8: West | 2,325 | 11,427,400 | 4,880 | 23,984,439 | — 9.0 | — 9.0 | — 21.3 | — 20.4 | 10.2 | 12.2 |
| Dist. 10: Panhandle | 775 | 3,471,200 | 1,420 | 6,360,206 | + 20.2 | + 20.2 | — 2.1 | + 7.8 | 3.0 | 3.2 |
| Utah | 200 | 1,125,400 | 422 | 2,374,639 | — 9.9 | — 9.9 | + 48.1 | + 51.9 | 0.9 | 1.2 |
| West Virginia | 370 | 898,800 | 748 | 1,869,678 | — 2.1 | — 7.4 | + 12.8 | + 2.9 | 1.6 | 0.9 |
| Wyoming | 425 | 1,969,400 | 748 | 3,483,950 | + 31.5 | + 30.0 | — 8.0 | — 4.9 | 1.6 | 1.8 |
| Other States* | 30 | 93,400 | 55 | 158,759 | + 20.0 | + 8.4 | + 12.2 | + 3.5 | 0.1 | 0.1 |
| Total United States | 24,690 | 100,314,200 | 47,952 | 196,794,248 | + 6.1 | + 4.0 | — 10.2 | — 10.4 | 100.0 | 100.0 |

* Other States include Arizona, Georgia, Idaho, Nevada, Maryland, North Carolina, Oregon, Tennessee, Virginia, and Washington.
[1] Gulf of Mexico wells are included in South Louisiana figures.

of 1957 have been corrected in recent months. Drastic cuts in crude oil production and refinery output, coupled with the government's import limitation, have resulted in an unusually heavy reduction of U. S. oil inventories in recent months. By midyear 1958, U. S. oil stocks were no longer excessive, except on the West Coast.

Substantially higher U. S. producing rates are certain in the last half of 1958, as producers and refiners no longer will need to hold supply below current consuming rates. U. S. crude oil production may be as much as one million barrels per day larger by December, 1958, than in the spring months of 1958, when it averaged only 6⅓ million barrels daily.

Higher producing rates will provide oil producers with both the funds and the incentive to drill a greater number of wells.

**Widespread increase.** The increase in drilling activity over first half rates is expected to be fairly widespread among states. Arkansas, Indiana, Colorado, Illinois, Kentucky, North Louisiana, Michigan, Mississippi, Montana, New Mexico, Ohio, Utah and Wyoming are seen as experiencing higher drilling rates in the last half of 1958 than in the first six months of year.

Notable among the states expected to have more drilling is Oklahoma, where the drilling of 4,110 wells is forecast for the last half of the year. This is an increase of 12.6 percent over the first six months. Oklahoma is one of the few states to drill more wells in the first six months of 1958 than in the corresponding period of 1957. For the full 12 months of 1958 Oklahoma is expected to complete 7,759 wells, a whopping 37 percent gain over the 1957 drilling.

***See next page for summary of drilling activity for the first six months of 1958.***

# United States Report: Drilling

## Wells, Footage and Average Depths Drilled in the United States, First Half of 1958 and 1957

| STATE or DISTRICT | TOTAL NEW WELLS DRILLED | | | | | | | | WILDCAT WELLS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | First Half 1958 | | | First Half 1957 | | | Percent Change 1958-1957 | | Drilled First Half 1958 | Drilled First Half 1957 | Percent Change 1958-1957 |
| | Wells | Footage | Average Depth | Wells | Footage | Average Depth | Wells | Footage | | | |
| Alabama | 38 | 332,308 | 8745 | 62 | 544,737 | 8786 | — 38.7 | — 39.0 | 13 | 22 | — 40.9 |
| Arkansas | 330 | 1,145,162 | 3470 | 507 | 1,503,967 | 2966 | — 34.9 | — 23.9 | 82 | 73 | + 12.3 |
| California | 748 | 3,491,688 | 4668 | 1,089 | 4,691,790 | 4308 | — 31.3 | — 25.6 | 117 | 181 | — 35.4 |
| Colorado | 381 | 1,999,836 | 5249 | 402 | 2,096,170 | 5214 | — 5.2 | — 4.6 | 197 | 246 | — 19.9 |
| Florida | 2 | 18,942 | 9471 | 6 | 40,312 | 6719 | — 66.7 | — 53.0 | 2 | 6 | — 66.7 |
| Illinois | 1,018 | 2,338,978 | 2298 | 1,187 | 2,655,090 | 2237 | — 14.2 | — 11.9 | 258 | 354 | — 27.1 |
| Indiana | 337 | 545,996 | 1620 | 323 | 507,302 | 1571 | + 4.3 | + 7.6 | 90 | 87 | + 3.4 |
| Kansas | 1,683 | 5,784,067 | 3437 | 2,023 | 7,206,396 | 3562 | — 16.8 | — 19.7 | 452 | 478 | — 5.4 |
| Kentucky | 661 | 939,355 | 1421 | 744 | 1,114,985 | 1499 | — 11.2 | — 15.8 | 30 | 59 | — 49.2 |
| Louisiana | 1,655 | 13,648,584 | 8247 | 1,790 | 14,867,058 | 8306 | — 7.6 | — 8.2 | 259 | 289 | — 10.4 |
| North Louisiana | 560 | 2,172,046 | 3879 | 622 | 2,321,280 | 3732 | — 10.0 | — 6.4 | 60 | 77 | — 22.1 |
| South Louisiana | 1,095 | 11,476,538 | 10481 | 1,168 | 12,545,778 | 10741 | — 6.3 | — 8.5 | 199 | 212 | — 6.1 |
| Michigan | 179 | 521,394 | 2913 | 192 | 551,416 | 2872 | — 6.8 | — 5.5 | 59 | 80 | — 26.3 |
| Mississippi | 177 | 1,566,164 | 8848 | 178 | 1,212,851 | 6814 | — 0.6 | + 29.1 | 79 | 95 | — 16.9 |
| Missouri | 8 | 5,206 | 651 | 1 | 370 | 370 | +700.0 | +1307.0 | 1 | 2 | — 50.0 |
| Montana | 161 | 915,302 | 5685 | 178 | 957,469 | 5379 | — 9.6 | — 4.4 | 69 | 55 | + 25.5 |
| Nebraska | 315 | 1,868,922 | 5933 | 423 | 2,499,749 | 5910 | — 25.5 | — 25.2 | 147 | 220 | — 33.2 |
| New Mexico | 969 | 4,632,855 | 4781 | 1,116 | 5,092,215 | 4563 | — 13.2 | — 9.0 | 140 | 146 | — 4.1 |
| New York | 288 | 442,800 | 1538 | 231 | 394,100 | 1706 | + 24.7 | + 12.4 | ..... | ..... | ..... |
| North Dakota | 196 | 1,340,037 | 6837 | 132 | 920,677 | 6975 | + 48.5 | + 45.5 | 59 | 56 | + 5.4 |
| Ohio | 481 | 1,240,571 | 2579 | 469 | 1,151,762 | 2456 | + 2.6 | + 7.7 | 3 | 3 | ..... |
| Oklahoma | 3,649 | 11,464,007 | 3142 | 2,809 | 10,272,372 | 3657 | + 16.1 | + 11.6 | 378 | 314 | + 20.4 |
| Pennsylvania | 284 | 640,488 | 2255 | 448 | 1,289,086 | 2877 | — 36.6 | — 50.3 | ..... | 25 | —100.0 |
| South Dakota | 3 | 16,991 | 5664 | 25 | 95,533 | 3821 | — 88.0 | — 82.2 | 3 | 24 | — 87.5 |
| Texas | 8,751 | 37,780,369 | 4317 | 11,011 | 46,022,793 | 4180 | — 20.5 | — 17.9 | 2,049 | 2,556 | — 19.8 |
| Dist. 1: South Central | 516 | 1,267,704 | 2457 | 696 | 1,743,345 | 2505 | — 25.9 | — 27.3 | 195 | 196 | — 0.5 |
| Dist. 2: Middle Gulf | 361 | 2,184,604 | 6052 | 363 | 2,276,055 | 6270 | — 0.6 | — 4.0 | 104 | 131 | — 20.6 |
| Dist. 3: Upper Gulf | 667 | 4,250,034 | 6372 | 876 | 5,933,451 | 6773 | — 23.9 | — 28.4 | 177 | 235 | — 24.7 |
| Dist. 4: Lower Gulf-S.W. | 609 | 3,123,131 | 5128 | 720 | 3,807,170 | 5288 | — 15.4 | — 18.0 | 245 | 224 | + 9.4 |
| Dist. 5 & 6: East Central and Northeast | 512 | 2,590,913 | 5060 | 624 | 3,336,091 | 5346 | — 18.0 | — 22.3 | 162 | 184 | — 12.0 |
| Dist. 7-B & 9: North Central and North | 2,886 | 8,917,938 | 3090 | 3,891 | 11,132,973 | 2861 | — 25.8 | — 19.9 | 715 | 1,071 | — 33.2 |
| Dist. 7-C & 8: West Central and West | 2,555 | 12,557,039 | 4915 | 3,142 | 15,027,018 | 4783 | — 18.7 | — 16.4 | 383 | 452 | — 15.3 |
| Dist. 10: Panhandle | 645 | 2,889,006 | 4479 | 699 | 2,766,690 | 3958 | — 7.7 | + 4.4 | 68 | 63 | + 7.9 |
| Utah | 222 | 1,249,239 | 5627 | 92 | 541,169 | 5882 | — 58.7 | — 69.2 | 41 | 47 | — 12.8 |
| Washington | 4 | 20,794 | 5199 | 2 | 12,003 | 6001 | +100.0 | + 73.2 | 3 | 2 | + 50.0 |
| West Virginia | 378 | 970,878 | 2568 | 284 | 778,738 | 2742 | + 33.1 | + 24.7 | 10 | 10 | ..... |
| Wyoming | 323 | 1,514,550 | 4689 | 344 | 1,473,976 | 4285 | — 6.1 | + 2.8 | 91 | 106 | — 14.2 |
| Other States* | 21 | 65,359 | 3112 | 10 | 49,349 | 4668 | +110.0 | + 32.4 | 9 | 10 | — 10.0 |
| Total United States | 23,262 | 96,500,842 | 4148 | 26,076 | 108,531,432 | 4162 | — 10.8 | — 11.1 | 4,641 | 5,544 | — 16.3 |

| STATE or DISTRICT | OIL | | | DISTILLATE | | | GAS | | | DRY | | | SERVICE WELLS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Wells | Footage | Avge. Depth | Wells | Footage | Avge. Depth | Wells | Footage | Avge. Depth | Wells | Footage | Avge. Depth | Wells | Footage | Avge. Depth |
| Alabama | 23 | 253,970 | 10999 | ..... | ..... | ..... | ..... | ..... | ..... | 15 | 78,338 | 5223 | ..... | ..... | ..... |
| Arkansas | 155 | 462,303 | 2983 | ..... | ..... | ..... | 16 | 89,298 | 5581 | 159 | 593,561 | 3733 | ..... | ..... | ..... |
| California | 535 | 2,329,880 | 4355 | ..... | ..... | ..... | 17 | 80,122 | 4713 | 196 | 1,081,686 | 5519 | ..... | ..... | ..... |
| Colorado | 85 | 450,073 | 5295 | ..... | ..... | ..... | 28 | 167,191 | 5971 | 268 | 1,382,572 | 5159 | ..... | ..... | ..... |
| Florida | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 18,942 | 9471 | ..... | ..... | ..... |
| Illinois | 409 | 978,227 | 2392 | ..... | ..... | ..... | 15 | 12,915 | 861 | 590 | 1,338,319 | 2268 | 4 | 9,517 | 2,379 |
| Indiana | 124 | 205,966 | 1661 | ..... | ..... | ..... | 8 | 8,137 | 1017 | 201 | 325,550 | 1620 | 4 | 6,343 | 1,586 |
| Kansas | 735 | 2,409,091 | 3278 | ..... | ..... | ..... | 112 | 448,143 | 4001 | 785 | 2,805,055 | 3573 | 51 | 121,778 | 2,388 |
| Kentucky | 244 | 262,726 | 1077 | 1 | 330 | 330 | 70 | 159,592 | 2280 | 339 | 508,948 | 1501 | 7 | 7,759 | 1,108 |
| Louisiana | 771 | 5,636,069 | 7310 | 115 | 1,369,735 | 11911 | 142 | 1,056,279 | 7439 | 626 | 5,578,283 | 8911 | 1 | 8,218 | 8,218 |
| North Louisiana | 274 | 876,083 | 3197 | 5 | 42,383 | 8477 | 79 | 315,534 | 3994 | 202 | 938,046 | 4644 | ..... | ..... | ..... |
| South Louisiana | 497 | 4,759,986 | 9577 | 110 | 1,327,352 | 12067 | 63 | 740,745 | 11758 | 424 | 4,640,237 | 10944 | 1 | 8,218 | 8,218 |
| Michigan | 71 | 217,757 | 3067 | ..... | ..... | ..... | 26 | 77,404 | 2977 | 82 | 226,233 | 2759 | ..... | ..... | ..... |
| Mississippi | 60 | 592,735 | 9879 | 8 | 76,657 | 9582 | 4 | 37,718 | 9430 | 105 | 859,054 | 8181 | ..... | ..... | ..... |
| Missouri | 2 | 1,591 | 795 | ..... | ..... | ..... | 3 | 1,303 | 434 | 3 | 2,312 | 771 | ..... | ..... | ..... |
| Montana | 73 | 496,381 | 6800 | 1 | 12,185 | 12185 | 4 | 17,200 | 4300 | 81 | 378,192 | 4669 | 2 | 11,344 | 5,672 |
| Nebraska | 92 | 561,704 | 6105 | ..... | ..... | ..... | ..... | ..... | ..... | 222 | 1,302,565 | 5867 | 1 | 4,653 | 4,653 |
| New Mexico | 563 | 2,768,769 | 4918 | 4 | 44,109 | 11027 | 217 | 961,675 | 4432 | 181 | 841,730 | 4650 | 4 | 16,572 | 4,143 |
| New York | 126 | 174,600 | 1386 | ..... | ..... | ..... | 6 | 21,000 | 3500 | 12 | 46,800 | 3900 | 144 | 200,400 | 1,392 |
| North Dakota | 119 | 854,567 | 7181 | ..... | ..... | ..... | ..... | ..... | ..... | 77 | 485,470 | 6305 | ..... | ..... | ..... |
| Ohio | 259 | 696,252 | 2688 | ..... | ..... | ..... | 126 | 326,448 | 2591 | 96 | 217,871 | 2269 | ..... | ..... | ..... |
| Oklahoma | 1,924 | 6,054,429 | 3147 | 43 | 350,269 | 8146 | 202 | 921,367 | 4561 | 1,208 | 3,717,295 | 3077 | 272 | 420,647 | 1,546 |
| Pennsylvania | 114 | 194,062 | 1702 | ..... | ..... | ..... | 116 | 347,402 | 2995 | 14 | 22,956 | 1640 | 40 | 76,068 | 1,902 |
| South Dakota | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 16,991 | 5664 | ..... | ..... | ..... |
| Texas | 4,786 | 19,626,353 | 4101 | 214 | 1,762,985 | 8238 | 594 | 3,054,291 | 5142 | 3,029 | 13,035,527 | 4304 | 128 | 301,213 | 2,353 |
| Dist. 1: South Central | 237 | 498,782 | 2105 | 8 | 54,206 | 6776 | 27 | 117,325 | 4345 | 244 | 597,391 | 2448 | ..... | ..... | ..... |
| Dist. 2: Middle Gulf | 108 | 630,161 | 5835 | 51 | 432,409 | 8479 | 47 | 205,974 | 4382 | 154 | 912,438 | 5925 | 1 | 3,622 | 3,622 |
| Dist. 3: Upper Gulf | 286 | 1,505,403 | 5264 | 51 | 494,763 | 9701 | 39 | 283,500 | 7269 | 291 | 1,966,368 | 6757 | ..... | ..... | ..... |
| Dist. 4: Lower Gulf S.-W. | 170 | 772,454 | 4544 | 59 | 468,416 | 7939 | 52 | 245,130 | 4714 | 328 | 1,637,131 | 4991 | ..... | ..... | ..... |
| Dist. 5 & 6: East Central and Northeast | 228 | 1,113,283 | 4883 | 15 | 110,351 | 7357 | 33 | 225,744 | 6841 | 235 | 1,137,768 | 4842 | 1 | 3,767 | 3,767 |
| Dist. 7-B & 9: North Central and North | 1,469 | 4,320,517 | 2941 | 24 | 141,674 | 5903 | 123 | 648,282 | 5271 | 1,174 | 3,605,815 | 3071 | 96 | 201,650 | 2,101 |
| Dist. 7-C & 8: West Central and West | 1,979 | 9,601,501 | 4852 | 3 | 37,877 | 12626 | 49 | 332,626 | 6788 | 494 | 2,492,861 | 5046 | 30 | 92,174 | 3,072 |
| Dist. 10: Panhandle | 309 | 1,184,252 | 3833 | 3 | 23,289 | 7763 | 224 | 995,710 | 4445 | 109 | 685,755 | 6291 | ..... | ..... | ..... |
| Utah | 154 | 890,129 | 5780 | ..... | ..... | ..... | 5 | 16,319 | 3264 | 63 | 342,791 | 5441 | ..... | ..... | ..... |
| Washington | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 | 20,794 | 5198 | ..... | ..... | ..... |
| West Virginia | 102 | 204,510 | 2005 | ..... | ..... | ..... | 228 | 654,816 | 2872 | 48 | 111,552 | 2324 | ..... | ..... | ..... |
| Wyoming | 167 | 825,802 | 4945 | ..... | ..... | ..... | 17 | 119,298 | 7018 | 137 | 557,743 | 4071 | 2 | 11,707 | 5,854 |
| Other States* | ..... | ..... | ..... | ..... | ..... | ..... | 3 | 13,200 | 4400 | 18 | 52,159 | 2898 | ..... | ..... | ..... |
| Total United States | 11,693 | 47,147,946 | 4032 | 386 | 3,616,270 | 9369 | 1,959 | 8,591,118 | 4385 | 8,564 | 35,949,289 | 4198 | 660 | 1,196,219 | 1,812 |

* Arizona, Georgia, Idaho, Maryland, Nevada, Oregon, Tennessee, Virginia.

# More new U.S. producing completions

**Anticipated increase in drilling during second half should boost the number of new producing wells to 14,693 in contrast with 14,039 in first six months.**

MORE NEW oil, gas and distillate producing wells should be completed in the U. S. during the last six months of 1958 than were drilled during the first six months of year. This should be the result of increased drilling activity predicted for the last half of 1958. (See preceding article.)

Based on industry experience, drilling activity forecast for the last six months of 1958 should result in the completion of approximately 14,693 new oil, gas and distillate producing wells, 4.7 percent more than the 14,039 completed during the first six months of the year. Second half producing completions should be comprised of approximately 12,192 oil wells and 2,501 gas and distillate producing wells. This would be in contrast with the completion of 11,693 new oil wells and 2,343 new gas and distillate producing wells completed during the first six months of 1958.

Despite the anticipated increase in rate of completing new producing wells, the volume will not be up to

**Forecast of New U. S. Productive Well Completions in Second Half of 1958 and Year 1958**

| STATE or DISTRICT | SECOND HALF 1958 FORECAST | | | FIRST HALF 1958 ACTUAL | | | FORECAST YEAR 1958 | | | 1957 ACTUAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | New Oil Wells | New Gas and Distillate Wells | Total Productive Wells | New Oil Wells | New Gas and Distillate Wells | Total Productive Wells | New Oil Wells | New Gas and Distillate Wells | Total Productive Wells | Total Productive Wells |
| Alabama | 20 | ..... | **20** | 23 | ..... | **23** | 43 | ..... | **43** | **54** |
| Arkansas | 155 | 15 | **170** | 155 | 16 | **171** | 310 | 31 | **341** | **726** |
| California | 445 | 15 | **460** | 535 | 17 | **552** | 980 | 32 | **1,012** | **1,656** |
| Colorado | 105 | 35 | **140** | 85 | 28 | **113** | 190 | 63 | **253** | **238** |
| Illinois | 490 | 20 | **510** | 409 | 15 | **424** | 899 | 35 | **934** | **1,071** |
| Indiana | 140 | 10 | **150** | 124 | 8 | **132** | 264 | 18 | **282** | **261** |
| Kansas | 880 | 135 | **1,015** | 735 | 112 | **847** | 1,615 | 247 | **1,862** | **2,236** |
| Kentucky | 330 | 95 | **425** | 244 | 71 | **315** | 574 | 166 | **740** | **775** |
| Louisiana | 785 | 260 | **1,045** | 771 | 257 | **1,028** | 1,556 | 517 | **2,073** | **2,335** |
| North Louisiana | 325 | 100 | **425** | 274 | 84 | **358** | 599 | 184 | **783** | **897** |
| South Louisiana | 460 | 160 | **620** | 497 | 173 | **670** | 957 | 333 | **1,290** | **1,438** |
| Gulf of Mexico[1] | 150 | 25 | **175** | 170 | 26 | **196** | 320 | 51 | **371** | **452** |
| Michigan | 85 | 30 | **115** | 71 | 26 | **97** | 156 | 56 | **212** | **199** |
| Mississippi | 70 | 15 | **85** | 60 | 12 | **72** | 130 | 27 | **157** | **138** |
| Missouri | 2 | 3 | **5** | 2 | 3 | **5** | 4 | 6 | **10** | **1** |
| Montana | 75 | 5 | **80** | 73 | 5 | **78** | 148 | 10 | **158** | **205** |
| Nebraska | 95 | ..... | **95** | 92 | ..... | **92** | 187 | ..... | **187** | **293** |
| New Mexico | 595 | 235 | **830** | 563 | 221 | **784** | 1,158 | 456 | **1,614** | **1,731** |
| New York | 90 | 5 | **95** | 126 | 6 | **132** | 216 | 11 | **227** | **268** |
| North Dakota | 130 | ..... | **130** | 119 | ..... | **119** | 249 | ..... | **249** | **165** |
| Ohio | 295 | 145 | **440** | 259 | 126 | **385** | 554 | 271 | **825** | **779** |
| Oklahoma | 2,165 | 275 | **2,440** | 1,924 | 245 | **2,169** | 4,089 | 520 | **4,609** | **3,404** |
| Pennsylvania | 115 | 115 | **230** | 114 | 116 | **230** | 229 | 231 | **460** | **612** |
| Texas | 4,675 | 850 | **5,525** | 4,786 | 808 | **5,594** | 9,461 | 1,658 | **11,119** | **13,604** |
| Dist. 1: S. Central | 250 | 35 | **285** | 237 | 35 | **272** | 487 | 70 | **557** | **738** |
| Dist. 2: Middle Gulf | 100 | 90 | **190** | 108 | 98 | **206** | 208 | 188 | **396** | **412** |
| Dist. 3: Upper Gulf | 275 | 85 | **360** | 286 | 90 | **376** | 561 | 175 | **736** | **919** |
| Dist. 4: L. Gulf-S.W. | 200 | 130 | **330** | 170 | 111 | **281** | 370 | 241 | **611** | **728** |
| Dist. 5 & 6: East | 245 | 50 | **295** | 228 | 48 | **276** | 473 | 98 | **571** | **728** |
| Dists. 7-B & 9: North | 1,435 | 145 | **1,580** | 1,469 | 147 | **1,616** | 2,904 | 292 | **3,196** | **3,883** |
| Dists. 7-C & 8: West | 1,800 | 45 | **1,845** | 1,979 | 52 | **2,031** | 3,779 | 97 | **3,876** | **4,957** |
| Dist. 10: Panhandle | 370 | 270 | **640** | 309 | 227 | **536** | 679 | 497 | **1,176** | **1,239** |
| Utah | 140 | 5 | **145** | 154 | 5 | **159** | 294 | 10 | **304** | **161** |
| West Virginia | 95 | 210 | **305** | 102 | 228 | **330** | 197 | 438 | **635** | **539** |
| Wyoming | 215 | 20 | **235** | 167 | 17 | **184** | 382 | 37 | **419** | **383** |
| Other States* | ..... | 3 | **3** | 2 | 1 | **3** | 2 | 4 | **6** | **15** |
| Total United States | 12,192 | 2,501 | **14,693** | 11,695 | 2,343 | **14,038** | 23,887 | 4,844 | **28,731** | **31,841** |

[1] Gulf of Mexico wells are included in South Louisiana figures.

* Other States include Alaska, Arizona, Florida, Georgia, Idaho, Maryland, Nevada, Oregon, South Dakota, Tennessee, Virginia and Washington.

1957 levels when higher drilling activity resulted in the completion of a larger number of producing wells.

The forecast for producing completions during the second half of 1958 would indicate the completion of 23,887 new oil wells, and 4,844 new gas and distillate producing wells during the full 12 months of 1958. This is a large number, but would still be far below the 31,841 productive wells actually completed during 1957.

While the rate of completing new producing wells during the last half of 1958 should be higher in many states than during the first six months of the year, only a few states are likely to complete more producing wells during the full year of 1958 than in 1957. Prospects indicate far more new producing wells will be completed this year in Oklahoma than in 1957. During the first six months of 1958, new productive completions in Oklahoma totaled 2,169, and the completion of 2,440 is forecast for the second half on the basis of increased drilling. Consequently, total producing completions for the 12 months of 1958 are expected to reach 4,609 in Oklahoma. In contrast, only 3,404 were completed in 1957.

Because it is the most active drilling state, Texas will have more new producing completions than any other state. A total of 5,525 new producing wells is forecast for Texas during the second six months, which would give it a total of 11,119 for the full year of 1958. The largest number of new Texas producing wells will be in West Texas, where a total of 3,876 are forecast for the year.

Louisiana is expected to have the third largest number of producing wells. A total of 2,073 new producing wells is predicted for Louisiana during the year 1958.

# Increased wildcatting is predicted

## Anticipated gain during second half of year will not be of sufficient proportions to restore activity to levels in existence during 1957.

HIGHER U. S. drilling rates during the second half of 1958 than in the first six months of the year will include a larger number of wildcat tests.

WORLD OIL forecasts the drilling of 4,904 wildcat tests during the second half of 1958, in contrast with the drilling of 4,577 during the first half of the year.

Despite the improved wildcatting rate anticipated in the last half of 1958, wildcat drilling for the year will still be below that of 1957. The number of wildcats predicted for the last six months of 1958 would result in the completion of 9,481 wildcats for the full year of 1958. In 1957, a total of 11,392 wildcats was drilled in the U. S.

Many states are expected to experience greater wildcat activity than in the first six months of 1958. Included among these are Colorado, Illinois, Indiana, Kansas, Kentucky, Michigan, Mississippi, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Texas and Wyoming.

However, increased activity in the second half will not be of sufficient proportions in most states to return wildcat operations to their 1957 levels. Oklahoma is the only state expected to drill more wildcats in 1958 than in 1957.

Texas will be the most active. A total of 2,063 wildcats are forecast for this state in the last half of 1958, compared with 2,049 in the first six months. This would mean the drilling of 4,112 wildcats in Texas during the full year, in contrast with 5,025 in 1957.

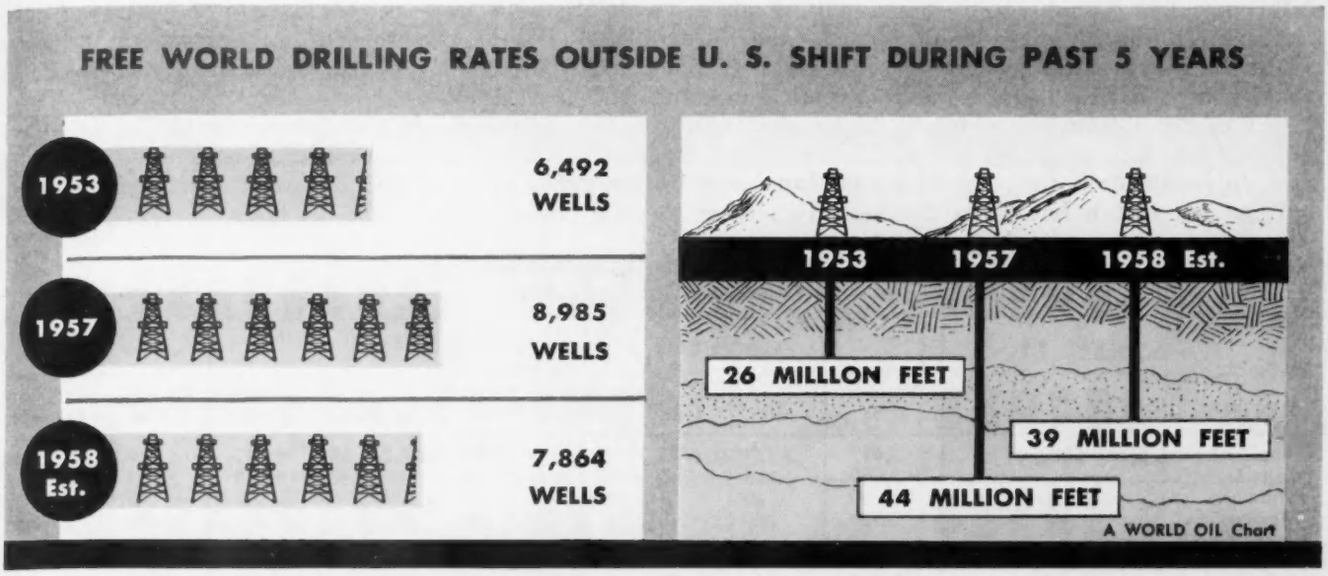
Kansas is expected to be the second most active wildcatting area. A forecast of 541 wildcats during the last half of 1958, combined with the 452 drilled in the first six months indicates a total of 993 wildcats for the year.

**Forecast of U. S. Wildcat Tests to Be Drilled Last Six Months 1958 and in Year 1958**

| STATE or DISTRICT | FORECAST | | DRILLED | |
|---|---|---|---|---|
| | Last Six Months 1958 | 12 Months 1958 | First Six Months 1958 | 12 Months 1957 |
| Alabama | 12 | 25 | 13 | 41 |
| Arkansas | 83 | 165 | 82 | 184 |
| California | 98 | 215 | 117 | 388 |
| Colorado | 246 | 443 | 197 | 483 |
| Florida | 1 | 3 | 2 | 9 |
| Illinois | 265 | 486 | 221 | 736 |
| Indiana | 74 | 140 | 66 | 169 |
| Kansas | 541 | 993 | 452 | 1,005 |
| Kentucky | 41 | 71 | 30 | 117 |
| Louisiana | 256 | 515 | 259 | 637 |
| North Louisiana | 72 | 132 | 60 | 201 |
| South Louisiana | 184 | 383 | 199 | 436 |
| †Gulf of Mexico | 20 | 43 | 23 | 69 |
| Michigan | 69 | 128 | 59 | 150 |
| Mississippi | 91 | 170 | 79 | 188 |
| Missouri | 1 | 2 | 1 | 10 |
| Montana | 73 | 142 | 69 | 172 |
| Nebraska | 152 | 299 | 147 | 451 |
| New Mexico | 147 | 287 | 140 | 297 |
| North Dakota | 65 | 124 | 59 | 148 |
| Ohio | 3 | 6 | 3 | 9 |
| Oklahoma | 427 | 805 | 378 | 659 |
| Pennsylvania | .... | .... | .... | 39 |
| South Dakota | 2 | 5 | 3 | 39 |
| Texas | 2,063 | 4,112 | 2,049 | 5,025 |
| Dist. 1: South Central | 207 | 402 | 195 | 372 |
| Dist. 2: Middle Gulf | 97 | 201 | 104 | 166 |
| Dist. 3: Upper Gulf | 169 | 346 | 177 | 435 |
| Dist. 4: Lower Gulf-S.W. | 289 | 534 | 245 | 463 |
| Dist. 5 & 6: East | 173 | 335 | 162 | 395 |
| Dist. 7-B & 9: North | 699 | 1,414 | 715 | 2,062 |
| Dist. 7-C & 8: West | 348 | 731 | 383 | 876 |
| Dist. 10: Panhandle | 81 | 149 | 68 | 156 |
| Utah | 37 | 78 | 41 | 115 |
| West Virginia | 9 | 19 | 10 | 25 |
| Wyoming | 118 | 209 | 91 | 277 |
| Other States* | 30 | 39 | 9 | 19 |
| Total United States | 4,904 | 9,481 | 4,577 | 11,392 |

† Gulf of Mexico wells included with South Louisiana.

* Arizona, Georgia, Idaho, Maryland, Nevada, Oregon, Tennessee, Virginia and Washington.




# World completions and footage . . . End of two-year downward trend forecast in second half of '58.

FIVE OIL PRODUCING AREAS in the Free World, exclusive of Russia and its satellites, will drill more wells in 1958 than last year and three will drill less, WORLD OIL forecasts. Estimated total for the seven areas is 55,816 wells, a decrease of 6,569 wells (10.5 percent) from the 1957 total of 62,385 wells.

The 1958 prediction follows a two-year downward trend. Last year's Free World total of 62,385 wells represented a decrease of 4,596 wells (6.9) percent from the record total of 66,981 wells drilled in 1956.

Total well forecasts for the seven major areas and percent increase or decrease from 1957: North America (excluding U. S.), 3,017 wells, down 22.5 percent; U. S., 47,952, down 10.2 percent; South America, 2,567, down 13.9 percent; Central America, 21 wells, up 133 percent; Western Europe, 1,214, up 5.2 percent; Africa, 270, up 20; Middle East, 240, up 20; Far East and Oceania, 535, up 1.7 percent.

**Brighter Second Half.** Although total well completions will be down considerably for the year in the three major oil producing areas of North and South America, the last half of 1958 will mark the end of a 24-month lag in drilling activity. Here is WORLD OIL's forecast for the three major oil producing areas:

- **United States.** The second half of 1958 will see higher drilling rates in the U. S., but not high enough to return activity to the levels of the past two years. Liquidation of excessive oil inventories and government limitation of imports will result in substantially higher producing rates, thus providing both the funds and the financing to drill more wells.

An estimated 24,690 wells will be drilled in the U. S. during the last six months, an increase of 1,428 wells (6.1 percent) over the 23,262 completed during the first half of 1958. An estimated 100,314,200 feet of hole will be drilled, a gain of 3.8 million feet (4.0 percent) over the first six months.

- **Western Canada.** WORLD OIL's survey of drilling plans indicates that 1,450 wells will be completed during the second half—35.5 percent more than the 1,070 wells drilled during the first six months. The forecast rate is only 5.7 percent below the drilling volumes in the last six months of 1957, compared with a first half drop of 26.5 percent below the corresponding period of 1957. The predicted drilling rate would result in the completion of 2,520 wells which would still be 15.8 percent under the 2,993 wells drilled in 1957.

In all the Canadian producing areas, operators are expected to complete 2,563 wells during 1958, 883 wells or 25.6 percent under the 1957 total of 3,346.

- **South America.** Results will be varied in the different oil areas, with an over-all decrease in drilling activity. Biggest decline will be in Venezuela, where only 1,400 new completions are expected, 19.8 percent less than were drilled in 1957. Venezuela's production has been curtailed sharply because of U. S. import restrictions and loss of Western European markets following reopening of the Suez canal to Middle East shipments.

Peru and Eucador will decline, as no tax or product price control appears likely.

**Overseas Activity Increases.** In contrast to the over-all decrease in Free World drilling activity, Western Europe, Africa, the Middle East and Far East have increased steadily in

well completions during recent years.

Western Europe will continue to be the third most active area in well completions this year with an expected total of 1,214 wells, compared with 1,154 wells in 1957 and 979 in 1956. In fourth place is the Far East and Oceania with a forecast of 535 wells, compared with 526 wells last year and 374 in 1956.

Operators in the Middle East are expected to complete 240 wells this year, compared with 200 in 1957 and 164 in 1956.

**Footage and Completions.** The 1958 decrease in total wells is expected to result in a corresponding drop in total footage drilled, even though the average well depths will be increased.

Breakdown of 1957 well completions in the Free World includes 33,067 oil wells, 5,210 gas wells and 2,493 dry holes.

## Free World Drilling Activity
(Exclusive of U.S.S.R. and Satellites)

| COUNTRY | Forecast Wells in 1958 | 1957 | | | | | | 1956 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Oil | Gas | Dry | Total Wells | Footage | Average Depth | Wells | Footage |
| **North America, Excl. U.S.** | **3,017** | **2,129** | **425** | **1,336** | **3,890** | **17,240,381** | **4,432** | **4,247** | **18,221,316** |
| Canada | 2,563 | 1,898 | 357 | 1,191 | 3,446 | 14,587,882 | 4,233 | 3,733 | 15,736,623 |
| Cuba | 60 | 26 | 0 | 27 | 53 | 125,086 | 2,360 | 104 | 272,597 |
| Mexico | 390 | 205 | 68 | 116 | 389 | 2,513,160 | 6,461 | 406 | 2,172,387 |
| Other North America | 4 | 0 | 0 | 2 | 2 | 14,253 | 7,127 | 4 | 39,709 |
| **South America** | **2,567** | **2,542** | **43** | **334** | **2,981** | **17,157,654** | **5,756** | **2,636** | **15,040,039** |
| Argentina | 350 | 286 | 19 | 41 | 346 | 1,789,883 | 5,173 | 298 | 1,673,000 |
| Bolivia | 30 | ..... | ..... | ..... | 37 | 120,868 | 3,267 | 25 | 107,282 |
| Brazil | 115 | 50 | 2 | 38 | 90 | 409,215 | 4,547 | 45 | 229,547 |
| Chile | 70 | 24 | 11 | 32 | 67 | 487,302 | 7,273 | 64 | 410,251 |
| Colombia | 160 | 128 | 0 | 28 | 156 | 1,013,131 | 6,494 | 138 | 815,479 |
| Ecuador | 20 | 61 | 2 | 11 | 74 | 205,133 | 2,772 | 156 | 300,739 |
| Paraguay | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Peru | 120 | 137 | 0 | 14 | 151 | 691,198 | 4,577 | 199 | 798,389 |
| Trinidad | 300 | 282 | 0 | 32 | 314 | 1,322,483 | 4,212 | 262 | 1,110,745 |
| Venezuela | 1,400 | 1,574 | 9 | 138 | 1,746† | 11,118,441 | 6,368 | 1,449 | 9,594,607 |
| **Central America** | **21** | **1** | **0** | **8** | **9** | **68,289** | **7,588** | **9** | **55,186** |
| **Western Europe** | **1,214** | **625** | **104** | **425** | **1,154** | **5,631,829** | **4,880** | **979** | **4,757,457** |
| Austria | 120 | 108 | 5 | 12 | 125 | 720,009 | 5,760 | 144 | 740,247 |
| France | 120 | 21 | 4 | 119 | 144 | 770,000 | 5,347 | 107 | 582,837 |
| Germany, West | 585 | 366 | 34 | 161 | 561 | 2,533,720 | 4,516 | 518 | 2,322,779 |
| Great Britain | 40 | 29 | 0 | 6 | 35 | 117,553 | 3,359 | 19 | 70,320 |
| Greece | 1 | 0 | 0 | 8 | 8 | 15,000 | 1,875 | 1 | 4,589 |
| Italy and Sicily | 265 | 43 | 57 | 107 | 207 | 1,115,695 | 5,390 | 159 | 884,900 |
| Netherlands | 70 | 58 | 2 | 5 | 65 | 263,300 | 4,051 | 14 | 94,458 |
| Portugal | 2 | 0 | 0 | 1 | 1 | 11,552 | 11,552 | 1 | 7,010 |
| Spain | 10 | 0 | 2 | 6 | 8 | 85,000 | 10,625 | 16 | 50,317 |
| Switzerland | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Africa** | **270** | **107** | **24** | **94** | **225** | **1,279,375** | **5,686** | **154** | **1,499,566** |
| Algeria | 70 | 15 | 19 | 24 | 58 | 406,651 | 7,011 | 56 | 318,808 |
| Egypt | 25 | 13 | 0 | 7 | 20 | 141,553 | 7,078 | 17 | 127,169 |
| Morocco | 20 | 9 | 1 | 11 | 21 | 97,082 | 4,623 | 21 | 113,384 |
| Tunisia | 6 | 0 | 0 | 5 | 5 | 36,100 | 7,220 | 4 | 37,908 |
| Other Africa | 149 | 70 | 4 | 47 | 121 | 597,989 | 4,942 | 56 | 333,105 |
| **Middle East** | **240** | **168** | **3** | **29** | **200** | **1,083,916** | **5,420** | **164** | **977,527** |
| Bahrain Island | 10 | 17 | 0 | 0 | 17 | 41,000 | 2,412 | 21 | 50,510 |
| Iran | 15 | 7 | 0 | 4 | 11 | 76,600 | 6,964 | 3 | 15,571 |
| Iraq | 15 | 9 | 2 | 6 | 17 | 111,396 | 6,553 | 12 | 137,487 |
| Israel | 15 | 8 | 0 | 3 | 11 | 145,934 | 13,267 | 23 | 139,817 |
| Kuwait | 55 | 49 | 0 | 0 | 49 | 240,000 | 4,898 | 25 | 136,963 |
| Neutral Zone | 60 | 46 | 0 | 8 | 54 | 110,390 | 2,044 | 29 | 83,985 |
| Qatar | 5 | 5 | 0 | 0 | 5 | 36,518 | 7,304 | 5 | 39,868 |
| Saudi Arabia | 27 | 16 | 1 | 1 | 18 | 147,000 | 8,167 | 20 | 124,713 |
| Turkey | 22 | 7 | 0 | 1 | 8 | 87,000 | 10,875 | 7 | 52,769 |
| Other Middle East | 16 | 4 | 0 | 6 | 10 | 88,078 | 8,808 | 19 | 195,844 |
| **Far East and Oceania** | **535** | **123** | **137** | **75** | **526** | **2,116,782** | **4,024** | **374** | **1,613,294** |
| Australia | 10 | ..... | ..... | ..... | ..... | ..... | ..... | 28 | 70,102 |
| Indonesia | 130 | ..... | ..... | 15 | 157 | 472,377 | 3.009 | 138 | 473,938 |
| Japan | 300 | 104 | 137 | 51 | 292 | 1,133,763 | 3,883 | 126 | 680,449 |
| New Guinea | 2 | 0 | 0 | 4 | 4 | 15,000 | 3,750 | 4 | 9,841 |
| New Zealand | 1 | 0 | 0 | 1 | 1 | 3,000 | 3,000 | ..... | ..... |
| Sarawak-Brunei (British Borneo) | 20 | 19 | 0 | 4 | 23 | 162,150 | 7,050 | 45 | 278,813 |
| Other Far East | 72 | ..... | ..... | ..... | 49 | 330,492 | 6,745 | 33 | 100,151 |
| **Total Free World Outside U.S.** | **7,864** | **5,695** | **736** | **2,301** | **8,985** | **44,578,226** | **4,961** | **8,563** | **42,164,385** |
| **United States** | **47,952** | **27,372** | **4,474** | **20,192** | **53,400*** | **219,626,073** | **4,113** | **58,418** | **235,386,441** |
| **Total Free World** | **55,816** | **33,067** | **5,210** | **22,493** | **62,385** | **264,204,299** | **4,235** | **66,981** | **277,550,826** |

† Includes 1,362 service wells.
* Includes 11 gas injection wells, 12 water injection wells, and 2 LPG injection wells.

## WORLD CRUDE OIL PRODUCTION GROWS 8 MILLION BARRELS DAILY IN PAST 10 YEARS

BARRELS DAILY

| | WORLD TOTAL | U. S. | | OUTSIDE U. S. | |
|---|---|---|---|---|---|
| | | | Percent of World Total | | Percent of World Total |
| 1958 Est. | 17,798,000 | 6,723,000 | 37.8 | 11,075,000 | 62.2 |
| 1957 | 17,889,781 | 7,174,033 | 40.1 | 10,715,748 | 59.9 |
| 1956 | 16,671,549 | 7,151,046 | 42.9 | 9,520,994 | 57.1 |
| 1952 | 12,337,800 | 6,262,200 | 51.0 | 6,075,600 | 49.0 |
| 1947 | 8,231,300 | 5,085,200 | 62.0 | 3,146,100 | 38.0 |

A WORLD OIL Chart

# World crude production . . .

## Europe leads way to new record level.

WORLD CRUDE PRODUCTION rose to a new high during 1957, with Europe, South America and Africa setting the pace. The record total: 6,529,770,000 barrels, for an increase of 427,983,000 barrels or 7.3 percent more than was produced during 1956. This compares with a 459.6 million barrel or 8.1 percent increase in 1956 over 1955.

Daily production averaged nearly 17.9 million barrels during 1957—1.2 million barrels per day more than was produced in 1956. Last year's cumulative production increased to 102.4 billion barrels.

However, WORLD OIL forecasts a slight decrease in world production to less than 6.5 billion barrels. This year's total will mark the first drop in world production since 1949.

**Europe Leads.** With the Suez Crisis and Communist countries providing the impetus, Europe contributed more than half of last year's world production increase. Total production jumped from 739,311,000 barrels in 1956 to 978,990,000 barrels last year —an increase of 239,679,000 barrels or 32.8 percent over 1956—for the world's second largest percentage increase in production.

Russia and its satellites contributed the lion's share of Europe's increase. The eight countries had a combined total production of 896,133,000 barrels last year, an increase of 229,032,000 barrels or 34.3 percent from the 1956 total. Russia alone increased its production 40 percent, from 571 million barrels in 1956 to 802 million last year.

The seven Free Europe nations increased production from 72,210,000 barrels in 1956 to 82,857,000 barrels last year, for a gain of 10.6 million barrels or 14.7 percent over 1956. This compares with an 18.7 percent gain in 1956 over 1955.

Demand for oil will continue to far exceed supply in Free Europe during 1958. Drilling and production are expected to follow the upward trend of activity that prevailed during 1957, despite less drilling in France due to a larger portion of funds being used in North Africa. Further growth in West Germany will offset the decline in France. Elsewhere in Free Europe, there will be relatively little change.

**Increases by Areas.** South America, the world's third largest oil producing area, also had the third largest production gain last year. The total increased nearly 132.3 million barrels, or 13.1 percent, from 1,036,222,000 barrels in 1956 to 1,168,511,000 barrels last year. South America reported a similar gain—13.7 percent—in 1956 over 1957.

Venezuela, which produces more than 85 percent of South America's oil, has the same production increase, 13.1 percent, as the continent's total. Brazil more than doubled its production last year, increasing the annual total from 4.1 million barrels in 1956 to 10.1 million in 1957. Ecuador was the only South American country to report a decrease in production—a decline of 5.7 percent to 3.2 million barrels.

The world's second largest producing area, the Middle East, had the fourth largest production gain—2.6 percent. The Middle East had the third largest gain, almost 7 percent, in 1956.

**Changing Production Picture.** North America, the world's largest producing area, dropped from fourth to sixth place in percentage gain last year.

## World Crude Oil Production, by Countries, 1957 and 1956, Cumulative Through 1957

(Sources: Annual data from private sources or estimates by WORLD OIL. Cumulative totals based on U. S. Bureau of Mines 1955 data)

| CONTINENT and COUNTRY | Annual Production (Thousand of Barrels) | | Daily Average Production (Actual Barrels) | | | Year's Production As Percent of World | | Cumulative Production To January 1, 1958 (Thousand of Barrels) | |
|---|---|---|---|---|---|---|---|---|---|
| | 1956 | 1957 | 1956 | 1957 | % Diff. '56-'57 | 1956 | 1957 | Total | As % of World |
| **North America** | **2,881,243** | **2,892,927** | **7,872,249** | **7,925,827** | **+ 0.7** | **47.21** | **44.30** | **61,881,326** | **60.42** |
| Canada | 169,321 | 181,813 | 462,626 | 498,118 | + 7.7 | 2.77 | 2.78 | 957,897 | 0.94 |
| Cuba | 543 | 395 | 1,484 | 1,081 | — 31.4 | 0.01 | 0.01 | 3,794 | ..... |
| Mexico | 94,096* | 92,197* | 257,093 | 252,595 | — 1.8 | 1.54 | 1.41 | 3,070,697 | 3.00 |
| United States | 2,617,283 | 2,618,522 | 7,151,046 | 7,174,033 | + 0.3 | 42.89 | 40.10 | 57,848,938 | 56.48 |
| **South America** | **1,036,222** | **1,168,511** | **2,831,208** | **3,201,400** | **+ 13.1** | **16.99** | **17.90** | **13,561,154** | **13.25** |
| Argentina | 31,717 | 33,855 | 86,659 | 92,752 | + 7.0 | 0.52 | 0.52 | 661,447 | 0.65 |
| Barbados | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | ..... |
| Bolivia | 3,196 | 3,575 | 8,732 | 9,796 | + 12.2 | 0.06 | 0.05 | 18,396 | 0.02 |
| Brazil | 4,059 | 10,106 | 11,090 | 27,688 | +149.7 | 0.06 | 0.16 | 20,515 | 0.02 |
| Chile | 3,542 | 4,337 | 9,678 | 11,882 | + 22.8 | 0.06 | 0.06 | 15,746 | 0.01 |
| Colombia | 43,819 | 45,738 | 119,725 | 125,309 | + 4.7 | 0.72 | 0.70 | 793,184 | 0.78 |
| Ecuador | 3,394 | 3,191 | 9,273 | 8,742 | — 5.7 | 0.06 | 0.05 | 70,806 | 0.06 |
| Peru | 18,383 | 19,222 | 50,227 | 52,662 | + 4.8 | 0.30 | 0.30 | 522,017 | 0.51 |
| Trinidad | 28,929 | 34,063 | 79,041 | 93,324 | + 18.1 | 0.48 | 0.52 | 589,061 | 0.58 |
| Venezuela | 899,183 | 1,014,424 | 2,456,785 | 2,779,245 | + 13.1 | 14.73 | 15.54 | 10,870,287 | 10.61 |
| **Europe** | **739,311** | **978,990** | **2,019,235** | **2,682,164** | **+ 32.8** | **12.12** | **15.00** | **12,591,137†** | **12.29** |
| Albania | 2,441 | 3,268 | 6,669 | 8,953 | + 34.2 | 0.04 | 0.05 | 30,671 | 0.03 |
| Austria | 23,268 | 21,623 | 63,574 | 59,241 | — 6.8 | 0.38 | 0.33 | 217,412 | 0.22 |
| Bulgaria | 1,600 | 1,800 | 4,371 | 5,100 | + 16.7 | 0.02 | 0.03 | 4,936 | ..... |
| Czechoslovakia | 1,201 | 673 | 3,281 | 1,844 | — 43.8 | 0.02 | 0.01 | 10,983 | 0.01 |
| France | 9,103 | 10,647 | 24,871 | 29,170 | + 17.3 | 0.15 | 0.17 | 51,870 | 0.05 |
| Germany, East | 271 | 32 | 744 | 88 | — 88.2 | ..... | ..... | n.a. | n.a. |
| Germany, West | 24,894 | 28,113 | 68,016 | 77,023 | + 13.2 | 0.41 | 0.43 | 238,926 | 0.23 |
| Great Britain | 489 | 614 | 1,338 | 1,683 | + 25.8 | 0.01 | 0.01 | 7,923 | 0.01 |
| Hungary | 7,630 | 5,110 | 20,847 | 14,000 | — 32.9 | 0.13 | 0.07 | 93,004 | 0.09 |
| Italy and Sicily | 4,822 | 8,555 | 13,175 | 23,438 | + 77.9 | 0.08 | 0.14 | 20,263 | 0.02 |
| Netherlands | 7,652 | 10,640 | 20,906 | 29,152 | + 39.4 | 0.13 | 0.16 | 62,203 | 0.06 |
| Poland | 1,363 | 1,350 | 3,724 | 3,700 | — 0.7 | 0.02 | 0.02 | 291,033 | 0.29 |
| Rumania | 81,387 | 81,900 | 222,369 | 224,600 | + 1.0 | 1.33 | 1.25 | 1,712,673 | 1.67 |
| U.S.S.R. (Russia) | 571,208 | 802,000 | 1,560,678 | 2,197,000 | + 40.8 | 9.36 | 12.29 | 9,834,856 | 9.60 |
| Yugoslavia | 1,982 | 2,665 | 5,415 | 7,281 | + 34.5 | 0.04 | 0.04 | 14,081 | 0.02 |
| **Africa** | **13,249** | **18,604** | **36,199** | **50,970** | **+ 40.8** | **0.22** | **0.28** | **267,254** | **0.26** |
| Algeria | 293 | 187 | 801 | 512 | — 36.1 | 0.01 | ..... | 2,701 | ..... |
| Egypt | 12,174 | 16,476 | 33,263 | 45,140 | + 35.7 | 0.20 | 0.25 | 257,209 | 0.25 |
| French Equatorial Africa | ..... | 1,282 | ..... | 3,511 | ..... | ..... | 0.02 | 1,282 | ..... |
| Morocco | 720 | 566 | 1,967 | 1,550 | — 21.2 | 0.01 | 0.01 | 5,907 | 0.01 |
| Nigeria | ..... | 9 | ..... | 880 | ..... | ..... | ..... | 9 | ..... |
| Angola | 62 | 84 | 169 | 231 | + 36.7 | ..... | ..... | 146 | ..... |
| **Asia, Total** | **1,431,744** | **1,470,733** | **3,922,586** | **4,029,405** | **+ 3.0** | **23.46** | **22.52** | **14,117,099** | **13.78** |
| **Asia, Middle East** | **1,262,943** | **1,291,657** | **3,450,664** | **3,538,786** | **+ 2.6** | **20.70** | **19.78** | **11,099,413** | **10.84** |
| Bahrain | 11,014 | 11,691 | 30,093 | 32,031 | + 6.4 | 0.18 | 0.18 | 198,571 | 0.19 |
| Iran | 198,289 | 261,340 | 541,774 | 716,000 | + 32.2 | 3.25 | 4.00 | 3,127,729 | 3.05 |
| Iraq | 233,421 | 163,498 | 637,762 | 447,940 | — 29.8 | 3.83 | 2.51 | 1,784,966 | 1.75 |
| Israel | 152 | 400 | 415 | 1,096 | +164.1 | ..... | ..... | 552 | ..... |
| Kuwait | 399,874 | 416,000 | 1,092,552 | 1,139,726 | + 4.3 | 6.55 | 6.37 | 2,638,999 | 2.57 |
| Neutral Zone | 11,725 | 23,200 | 32,036 | 63,562 | — 98.4 | 0.19 | 0.35 | 49,768 | 0.05 |
| Qatar | 45,345 | 51,356 | 123,893 | 140,701 | + 13.6 | 0.74 | 0.79 | 262,441 | 0.26 |
| Saudi Arabia | 360,923 | 362,121 | 986,129 | 992,114 | + 0.6 | 5.91 | 5.55 | 3,029,853 | 2.96 |
| Turkey | 2,200 | 2,051 | 6,011 | 5,619 | — 6.5 | 0.04 | 0.03 | 6,534 | ..... |
| **Asia, Far East** | **168,801** | **179,076** | **461,205** | **490,619** | **+ 6.4** | **2.76** | **2.74** | **3,017,686** | **2.94** |
| Burma | 1,680 | 2,610 | 4,590 | 7,150 | + 55.8 | 0.03 | 0.04 | ..... | ..... |
| India | 2,876 | 3,407 | 7,858 | 5,335 | + 18.8 | 0.04 | 0.06 | 383,134 | 0.38 |
| Pakistan | 2,114 | 1,984 | 5,776 | 5,435 | — 5.9 | 0.04 | 0.03 | ..... | ..... |
| China | 11,000 | 10,200 | 30,055 | 27,945 | — 7.0 | 0.18 | 0.15 | 35,927 | 0.03 |
| Indonesia | 93,820 | 114,283 | 256,339 | 313,105 | + 22.1 | 1.54 | 1.75 | 1,834,387 | 1.79 |
| Japan | 2,169 | 2,243 | 5,926 | 6,145 | + 3.7 | 0.03 | 0.03 | 113,782 | 0.11 |
| New Guinea | 2,618 | 2,294 | 7,154 | 6,286 | — 12.1 | 0.04 | 0.03 | 21,201 | 0.03 |
| Sakhalin | 7,000 | n.a. | 19,126 | n.a. | n.a. | 0.12 | n.a. | 137,740 | 0.13 |
| Sarawak-Brunei (Br. Borneo) | 45,503 | 42,038 | 124,325 | 115,172 | — 7.4 | 0.74 | 0.65 | 491,054 | 0.48 |
| Taiwan (Formosa) | 21 | 17 | 57 | 48 | — 15.8 | ..... | ..... | 461 | ..... |
| **Australia-New Zealand** | **18** | **5** | **49** | **13** | **— 73.5** | ..... | ..... | **113** | ..... |
| **World, Undistributed** | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **1,044** | ..... |
| **Total World** | **6,101,787** | **6,529,770** | **16,671,549** | **17,889,781** | **+ 7.3** | **100.0** | **100.0** | **102,419,127** | **100.0** |

* Includes absorption liquids.

† Includes 1956 and 1957 production from East Germany.

# World Crude Oil Production, By Countries, By Years (Part 1)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: U. S. Bureau of Mines annual reports, *Mineral Resources and Minerals Yearbook*, and monthly reports, International Petroleum Trade and World Petroleum Statistics, except as otherwise indicated.)

## World and North America, 1857-1895

| YEAR | World Total | Percent Produced by U. S. | Canada | United States | Total North America | YEAR | World Total | Percent Produced by U. S. | Canada | United States | Total North America |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1856 | .... | .... | .... | .... | .... | 1876 | 11,051 | 83 | 312 | 9,133 | 9,445 |
| 1857 | 2 | .... | .... | .... | .... | 1877 | 15,754 | 85 | 312 | 13,350 | 13,662 |
| 1858 | 4 | .... | .... | .... | .... | 1878 | 18,417 | 84 | 312 | 15,397 | 15,709 |
| 1859 | 6 | 31 | .... | 2 | 2 | 1879 | 23,601 | 84 | 575 | 19,914 | 20,489 |
| 1860 | 509 | 98 | .... | 500 | 500 | 1880 | 30,018 | 88 | 350 | 26,286 | 26,636 |
| 1861 | 2,131 | 99 | .... | 2,114 | 2,114 | 1881 | 31,993 | 86 | 275 | 27,661 | 27,936 |
| 1862 | 3,092 | 99 | 12 | 3,057 | 3,069 | 1882 | 35,704 | 85 | 275 | 30,350 | 30,625 |
| 1863 | 2,763 | 94 | 83 | 2,611 | 2,694 | 1883 | 30,255 | 78 | 250 | 23,450 | 23,700 |
| 1864 | 2,304 | 92 | 90 | 2,116 | 2,206 | 1884 | 35,969 | 67 | 250 | 24,218 | 24,468 |
| 1865 | 2,716 | 92 | 110 | 2,498 | 2,608 | 1885 | 36,765 | 59 | 250 | 21,859 | 22,109 |
| 1866 | 3,899 | 92 | 175 | 3,598 | 3,773 | 1886 | 47,243 | 59 | 584 | 28,065 | 28,649 |
| 1867 | 3,709 | 90 | 190 | 3,347 | 3,537 | 1887 | 47,807 | 59 | 526 | 28,283 | 28,809 |
| 1868 | 3,990 | 91 | 200 | 3,646 | 3,846 | 1888 | 52,165 | 53 | 695 | 27,612 | 28,307 |
| 1869 | 4,696 | 90 | 220 | 4,215 | 4,435 | 1889 | 61,507 | 57 | 705 | 35,164 | 35,869 |
| 1870 | 5,799 | 91 | 250 | 5,261 | 5,511 | 1890 | 76,633 | 60 | 795 | 45,824 | 46,619 |
| 1871 | 5,730 | 91 | 270 | 5,205 | 5,475 | 1891 | 91,100 | 60 | 755 | 54,293 | 55,048 |
| 1872 | 6,877 | 92 | 308 | 6,293 | 6,601 | 1892 | 88,739 | 57 | 780 | 50,515 | 51,295 |
| 1873 | 10,838 | 91 | 365 | 9,894 | 10,259 | 1893 | 92,038 | 53 | 798 | 48,431 | 49,229 |
| 1874 | 11,933 | 92 | 169 | 10,927 | 11,096 | 1894 | 89,337 | 55 | 829 | 49,344 | 50,173 |
| 1875 | 9,977 | 88 | 220 | 8,788 | 9,008 | 1895 | 103,692 | 51 | 726 | 52,892 | 53,618 |

## World and North America, 1896 to Now

## South America, Since Beginning in 1896

| YEAR | WORLD TOTAL | Percent Produced by U.S. | NORTH AMERICA | | | | | Argentina | Barbados | Bolivia | Brazil | Chile | Colombia | Ecuador | Peru | Trinidad | Venezuela | Total South America |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Canada | Mexico | United States | Cuba | Total North America | | | | | | | | | | | |
| 1896 | 114,199 | 53 | 727 | ..... | 60,960 | ..... | 61,687 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 47 | ..... | ..... | 47 |
| 1897 | 121,993 | 50 | 710 | ..... | 60,476 | ..... | 61,186 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 71 | ..... | ..... | 71 |
| 1898 | 124,979 | 44 | 758 | ..... | 55,364 | ..... | 56,122 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 71 | ..... | ..... | 71 |
| 1899 | 131,147 | 44 | 808 | ..... | 57,071 | ..... | 57,879 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 89 | ..... | ..... | 89 |
| 1900 | 149,137 | 43 | 913 | ..... | 63,621 | ..... | 64,534 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 274 | ..... | ..... | 274 |
| 1901 | 167,440 | 41 | 757 | 10 | 69,389 | ..... | 70,156 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 275 | ..... | ..... | 275 |
| 1902 | 181,809 | 49 | 531 | 40 | 88,767 | ..... | 89,338 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 287 | ..... | ..... | 287 |
| 1903 | 194,879 | 52 | 487 | 75 | 100,461 | ..... | 101,023 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 278 | ..... | ..... | 278 |
| 1904 | 217,948 | 54 | 553 | 126 | 117,081 | ..... | 117,760 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 290 | ..... | ..... | 290 |
| 1905 | 215,091 | 63 | 634 | 251 | 134,717 | ..... | 135,602 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 373 | ..... | ..... | 373 |
| 1906 | 213,263 | 59 | 569 | 502 | 126,494 | ..... | 127,565 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 531 | ..... | ..... | 531 |
| 1907 | 263,957 | 63 | 789 | 1,005 | 166,095 | ..... | 167,889 | B | ..... | ..... | ..... | ..... | ..... | ..... | 751 | ..... | ..... | 751 |
| 1908 | 285,287 | 63 | 528 | 3,933 | 178,527 | ..... | 182,988 | 12 | ..... | ..... | ..... | ..... | ..... | ..... | 945 | B | ..... | 957 |
| 1909 | 298,709 | 61 | 421 | 2,714 | 183,171 | ..... | 186,306 | 18 | ..... | ..... | ..... | ..... | ..... | ..... | 1,411 | 57 | ..... | 1,486 |
| 1910 | 327,763 | 64 | 316 | 3,634 | 209,557 | ..... | 213,507 | 20 | ..... | ..... | ..... | ..... | ..... | ..... | 1,258 | 143 | ..... | 1,421 |
| 1911 | 344,361 | 64 | 291 | 12,553 | 220,449 | ..... | 233,293 | 13 | ..... | ..... | ..... | ..... | ..... | ..... | 1,465 | 285 | ..... | 1,763 |
| 1912 | 352,443 | 63 | 243 | 16,558 | 222,935 | ..... | 239,736 | 47 | ..... | ..... | ..... | ..... | ..... | ..... | 1,752 | 437 | ..... | 2,236 |
| 1913 | 385,345 | 64 | 228 | 25,696 | 248,446 | ..... | 274,370 | 131 | ..... | ..... | ..... | ..... | ..... | ..... | 2,071 | 504 | ..... | 2,706 |
| 1914 | 407,544 | 65 | 215 | 26,235 | 265,763 | ..... | 292,213 | 276 | ..... | ..... | ..... | ..... | ..... | ..... | 1,837 | 644 | ..... | 2,757 |
| 1915 | 432,033 | 65 | 215 | 32,911 | 281,104 | ..... | 314,230 | 513 | ..... | ..... | ..... | ..... | ..... | ..... | 2,579 | 750 | ..... | 3,842 |
| 1916 | 457,500 | 66 | 198 | 40,546 | 300,767 | ..... | 341,511 | 867 | ..... | ..... | ..... | ..... | ..... | ..... | 2,593 | 929 | ..... | 4,389 |
| 1917 | 502,891 | 67 | 214 | 55,293 | 335,316 | ..... | 390,823 | 1,218 | ..... | ..... | ..... | ..... | ..... | 57 | 2,577 | 1,602 | 120 | 5,574 |
| 1918 | 503,515 | 71 | 305 | 63,828 | 355,928 | ..... | 420,061 | 1,353 | ..... | ..... | ..... | ..... | ..... | C60 | 2,527 | 2,082 | 333 | 6,355 |
| 1919 | 555,875 | 68 | 241 | 87,073 | 378,367 | ..... | 465,681 | 1,331 | ..... | ..... | ..... | ..... | ..... | C60 | 2,628 | 1,841 | 425 | 6,285 |
| 1920 | 688,884 | 64 | 196 | 157,069 | 442,929 | ..... | 600,194 | 1,651 | ..... | ..... | ..... | ..... | ..... | C60 | 2,817 | 2,083 | 457 | 7,068 |
| 1921 | 766,002 | 62 | 188 | 193,398 | 472,183 | ..... | 665,769 | 2,036 | ..... | ..... | ..... | ..... | 67 | C60 | 3,699 | 2,354 | 1,433 | 9,649 |
| 1922 | 858,898 | 65 | 179 | 182,278 | 557,531 | ..... | 739,988 | 2,866 | ..... | ..... | ..... | ..... | 323 | C60 | 5,314 | 2,445 | 2,201 | 13,209 |
| 1923 | 1,015,736 | 72 | 170 | 149,585 | 732,407 | ..... | 882,162 | 3,400 | ..... | ..... | ..... | ..... | 425 | 57 | 5,699 | 3,051 | 4,201 | 16,863 |
| 1924 | 1,014,318 | 70 | 161 | 139,678 | 713,940 | ..... | 853,779 | 4,639 | ..... | ..... | ..... | ..... | 445 | C100 | 8,379 | 4,057 | 9,042 | 26,662 |
| 1925 | 1,068,933 | 71 | 332 | 115,515 | 763,743 | ..... | 879,590 | 6,336 | ..... | ..... | ..... | ..... | 1,007 | 160 | 9,232 | 4,387 | 19,687 | 40,809 |
| 1926 | 1,096,823 | 70 | 364 | 90,421 | 770,874 | ..... | 861,659 | 7,851 | ..... | ..... | ..... | ..... | 6,444 | 214 | 10,762 | 4,971 | 36,911 | 67,153 |
| 1927 | 1,262,582 | 71 | 477 | 64,121 | 901,129 | ..... | 965,727 | 8,630 | ..... | ..... | ..... | ..... | 15,014 | 537 | 10,127 | 5,380 | 63,134 | 102,822 |
| 1928 | 1,324,774 | 68 | 624 | 50,151 | 901,474 | ..... | 952,249 | 9,070 | ..... | ..... | ..... | ..... | 19,897 | 1,084 | 12,006 | 7,684 | 105,749 | 155,490 |
| 1929 | 1,485,867 | 68 | 1,117 | 44,688 | 1,007,323 | ..... | 1,053,128 | 9,391 | ..... | B | ..... | ..... | 20,385 | 1,381 | 13,422 | 8,716 | 137,472 | 190,767 |
| 1930 | 1,410,037 | 64 | 1,522 | 39,530 | 898,011 | ..... | 939,063 | 9,002 | ..... | 56 | ..... | ..... | 20,346 | 1,553 | 12,449 | 9,419 | 136,669 | 189,494 |
| 1931 | 1,372,532 | 62 | 1,543 | 33,039 | 851,081 | ..... | 885,663 | 11,709 | ..... | 25 | ..... | ..... | 18,237 | 1,762 | 10,089 | 9,744 | 116,613 | 168,179 |
| 1932 | 1,309,684 | 60 | 1,044 | 32,805 | 785,159 | ..... | 819,008 | 13,139 | ..... | 44 | ..... | ..... | 16,414 | 1,597 | 9,899 | 10,126 | 116,541 | 167,760 |
| 1933 | 1,442,153 | 63 | 1,145 | 34,001 | 905,656 | 23 | 940,825 | 13,691 | ..... | 112 | ..... | ..... | 13,158 | 1,620 | 13,257 | 9,561 | 117,720 | 169,119 |
| 1934 | 1,522,287 | 60 | 1,417 | 38,172 | 908,065 | 28 | 947,682 | 14,024 | ..... | 159 | ..... | ..... | 17,341 | 1,637 | 16,314 | 10,894 | 136,103 | 196,472 |
| 1935 | 1,654,488 | 60 | 1,447 | 40,241 | 996,596 | 47 | 1,038,331 | 14,297 | ..... | 164 | ..... | ..... | 17,598 | 1,732 | 17,067 | 11,671 | 148,254 | 210,783 |
| 1936 | 1,791,540 | 61 | 1,500 | 41,028 | 1,099,687 | 62 | 1,142,277 | 15,458 | ..... | 105 | ..... | ..... | 18,756 | 1,942 | 17,593 | 13,237 | 154,794 | 221,885 |
| 1937 | 2,039,231 | 63 | 2,944 | 46,907 | 1,279,160 | 33 | 1,329,044 | 16,355 | ..... | 122 | ..... | ..... | 20,599 | 2,161 | 17,457 | 15,503 | 186,230 | 258,427 |
| 1938 | 1,988,041 | 61 | 6,966 | 38,506 | 1,214,355 | 78 | 1,259,905 | 17,076 | ..... | 226 | ..... | ..... | 21,582 | 2,246 | 15,839 | 17,737 | 188,174 | 262,880 |
| 1939 | 2,086,160 | 60.6 | 7,838 | 42,898 | 1,264,962 | 112 | 1,315,810 | 18,613 | ..... | 215 | ..... | ..... | 23,857 | 2,313 | 13,508 | 19 270 | 206,470 | 284,246 |
| 1940 | 2,149,821 | 62.9 | 8,591 | 44,036 | 1,353,214 | 142 | 1,405,983 | 20,609 | ..... | 288 | 2 | ..... | 25,593 | 2,349 | 12,126 | 22,227 | 185,570 | 268,764 |
| 1941 | 2,220,657 | 63.1 | 10,134 | 42,196 | 1,402,228 | 150 | 1,454,708 | 21,873 | ..... | 235 | 3 | ..... | 24,553 | 1,557 | 11,935 | 20,506 | 228,430 | 309,092 |
| 1942 | 2,093,100 | 66.2 | 10,365 | 34,815 | 1,386,645 | 151 | 1,431,976 | 23,704 | 2 | 308 | 33 | ..... | 10,487 | 2,278 | 13,629 | 22,069 | 147,675 | 220,185 |
| 1943 | 2,256,637 | 66.7 | 10,052 | 35,163 | 1,505,613 | 107 | 1,550,935 | 27,714 | 2 | 334 | 48 | ..... | 13,261 | 2,315 | 14,654 | 21,385 | 177,631 | 257,344 |
| 1944 | 2,592,289 | 64.7 | 10,099 | 38,203 | 1,677,904 | 109 | 1,726,315 | 24,230 | 1 | 314 | 58 | ..... | 22,291 | 2,967 | 14,389 | 22,139 | 257,046 | 343,435 |
| 1945 | 2,594,697 | 66.0 | 8,483 | 43,547 | 1,713,655 | 149 | 1,765,834 | 22,881 | 2 | 382 | 79 | ..... | 22,449 | 2,654 | 13,744 | 21,093 | 323,156 | 406,450 |
| 1946 | 2,745,430 | 63.2 | 7,586 | 49,235 | 1,733,939 | 269 | 1,791,029 | 20,604 | 1 | 363 | 67 | ..... | 22,118 | 2,323 | 12,468 | 20,233 | 388,486 | 466,663 |
| 1947 | 3,022,139 | 61.4 | 7,692 | 56,284 | 1,856,987 | 300 | 1,921,263 | 21,846 | B | 377 | 97 | ..... | 24,794 | 2,282 | 12,764 | 20,521 | 434,905 | 517,586 |
| 1948 | 3,433.225 | 58.8 | 12,287 | 58,508 | 2,020,185 | 159 | 2,091,139 | 23,734 | ..... | 464 | 144 | ..... | 23,792 | 2,563 | 14,069 | 20,111 | 490,015 | 574,892 |
| 1949 | 3,404,132 | 54.1 | 21,305 | 60,910 | 1,841,940 | 206 | 1,924,361 | 22,589 | ..... | 678 | 109 | ..... | 29,722 | 2,617 | 14,796 | 20,617 | 482,316 | 573,444 |
| 1950 | 3,802,995 | 51.9 | 29,044 | 72,443 | 1,973,574 | 156 | 2,075,217 | 23,353 | ..... | 616 | 339 | 629 | 34,060 | 2,632 | 15,012 | 20,632 | 546,783 | 644,056 |
| 1951 | 4,282,730 | 52.5 | 47,615 | 77,312 | 2,247,711 | 128 | 2,372,766 | 24,465 | ..... | 523 | 691 | 760 | 38,398 | 2,708 | 16,110 | 20,843 | 622,216 | 726,714 |
| 1952 | 4,504,708 | 50.8 | 61,237 | 77,275 | 2,289,836 | 36 | 2,428,384 | 24,588 | ..... | 526 | 750 | 910 | 38,683 | 2,839 | 16,403 | 21,258 | 660,254 | 766,211 |
| 1953 | 4,786,989 | 49.2 | 80,899 | 72,440 | 2,357,082 | 17 | 2,510,438 | 28,501 | ..... | 601 | 916 | 1,258 | 40,179 | 2,967 | 15,999 | 22,346 | 644,243 | 757,010 |
| 1954 | 5,006,741 | 46.2 | 96,080 | 83,653 | 2,314,988 | 25 | 2,494,746 | 29,650 | ..... | 1,695 | 992 | 1,736 | 40,547 | 3,146 | 17,161 | 23,629 | 691,808 | 810,364 |
| 1955 | 5,642,439 | 44.0 | 129,453 | 91,370 | 2,484,428 | 369 | 2,705,620 | 30,501 | ..... | 2,693 | 2,022 | 2,574 | 40,492 | 3,531 | 17,244 | 24,896 | 787,413 | 911,366 |
| 1956* | 6,101,787 | 42.9 | 169,321 | 94,096 | 2,617,283 | 543 | 2,881,243 | 31,717 | ..... | 3,196 | 4,059 | 3,542 | 43,819 | 3,394 | 18,383 | 28,929 | 899,183 | 1,036,222 |
| 1957* | 6,529,770 | ..... | 181,813 | 92,197 | 2,618,522 | 395 | 2,892,927 | 33,855 | ..... | 3,575 | 10,106 | 4,337 | 45,738 | 3,191 | 19,222 | 34,063 | 1,014,424 | 1,168,511 |
| Total | 102,419,127 | ..... | 957,879 | 3,070,697 | 57,848,938 | 3,794 | 61,881,326 | 661,447 | 8 | 18,396 | 20,515 | 15,746 | 792,871 | 70,806 | 522,017 | 589,061 | 10,870,287 | 13,561,154 |

B Less than 1,000 barrels. C Estimated production. * WORLD OIL from private sources.

## World Crude Oil Production, by Countries, 1957 and 1956, Cumulative Through 1957

(Sources: Annual data from private sources or estimates by WORLD OIL. Cumulative totals based on U. S. Bureau of Mines 1955 data)

| CONTINENT and COUNTRY | Annual Production (Thousand of Barrels) | | Daily Average Production (Actual Barrels) | | | Year's Production As Percent of World | | Cumulative Production To January 1, 1958 (Thousand of Barrels) | |
|---|---|---|---|---|---|---|---|---|---|
| | 1956 | 1957 | 1956 | 1957 | % Diff. '56-'57 | 1956 | 1957 | Total | As % of World |
| **North America** | **2,881,243** | **2,892,927** | **7,872,249** | **7,925,827** | **+ 0.7** | **47.21** | **44.30** | **61,881,326** | **60.42** |
| Canada | 169,321 | 181,813 | 462,626 | 498,118 | + 7.7 | 2.77 | 2.78 | 957,897 | 0.94 |
| Cuba | 543 | 395 | 1,484 | 1,081 | — 31.4 | 0.01 | 0.01 | 3,794 | ..... |
| Mexico | 94,096* | 92,197* | 257,093 | 252,595 | — 1.8 | 1.54 | 1.41 | 3,070,697 | 3.00 |
| United States | 2,617,283 | 2,618,522 | 7,151,046 | 7,174,033 | + 0.3 | 42.89 | 40.10 | 57,848,938 | 56.48 |
| **South America** | **1,036,222** | **1,168,511** | **2,831,208** | **3,201,400** | **+ 13.1** | **16.99** | **17.90** | **13,561,154** | **13.25** |
| Argentina | 31,717 | 33,855 | 86,659 | 92,752 | + 7.0 | 0.52 | 0.52 | 661,447 | 0.65 |
| Barbados | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 | ..... |
| Bolivia | 3,196 | 3,575 | 8,732 | 9,796 | + 12.2 | 0.06 | 0.05 | 18,396 | 0.02 |
| Brazil | 4,059 | 10,106 | 11,090 | 27,688 | +149.7 | 0.06 | 0.16 | 20,515 | 0.02 |
| Chile | 3,542 | 4,337 | 9,678 | 11,882 | + 22.8 | 0.06 | 0.06 | 15,746 | 0.01 |
| Colombia | 43,819 | 45,738 | 119,725 | 125,309 | + 4.7 | 0.72 | 0.70 | 793,184 | 0.78 |
| Ecuador | 3,394 | 3,191 | 9,273 | 8,742 | — 5.7 | 0.06 | 0.05 | 70,806 | 0.06 |
| Peru | 18,383 | 19,222 | 50,227 | 52,662 | + 4.8 | 0.30 | 0.30 | 522,017 | 0.51 |
| Trinidad | 28,929 | 34,063 | 79,041 | 93,324 | + 18.1 | 0.48 | 0.52 | 589,061 | 0.58 |
| Venezuela | 899,183 | 1,014,424 | 2,456,785 | 2,779,245 | + 13.1 | 14.73 | 15.54 | 10,870,287 | 10.61 |
| **Europe** | **739,311** | **978,990** | **2,019,235** | **2,682,164** | **+ 32.8** | **12.12** | **15.00** | **12,591,137†** | **12.29** |
| Albania | 2,441 | 3,268 | 6,669 | 8,953 | + 34.2 | 0.04 | 0.05 | 30,671 | 0.03 |
| Austria | 23,268 | 21,623 | 63,574 | 59,241 | — 6.8 | 0.38 | 0.33 | 217,412 | 0.22 |
| Bulgaria | 1,600 | 1,800 | 4,371 | 5,100 | + 16.7 | 0.02 | 0.03 | 4,936 | ..... |
| Czechoslovakia | 1,201 | 673 | 3,281 | 1,844 | — 43.8 | 0.02 | 0.01 | 10,983 | 0.01 |
| France | 9,103 | 10,647 | 24,871 | 29,170 | + 17.3 | 0.15 | 0.17 | 51,870 | 0.05 |
| Germany, East | 271 | 32 | 744 | 88 | — 88.2 | ..... | ..... | n.a. | n.a. |
| Germany, West | 24,894 | 28,113 | 68,016 | 77,023 | + 13.2 | 0.41 | 0.43 | 238,926 | 0.23 |
| Great Britain | 489 | 614 | 1,338 | 1,683 | + 25.8 | 0.01 | 0.01 | 7,923 | 0.01 |
| Hungary | 7,630 | 5,110 | 20,847 | 14,000 | — 32.9 | 0.13 | 0.07 | 93,004 | 0.09 |
| Italy and Sicily | 4,822 | 8,555 | 13,175 | 23,438 | + 77.9 | 0.08 | 0.14 | 20,263 | 0.02 |
| Netherlands | 7,652 | 10,640 | 20,906 | 29,152 | + 39.4 | 0.13 | 0.16 | 62,203 | 0.06 |
| Poland | 1,363 | 1,350 | 3,724 | 3,700 | — 0.7 | 0.02 | 0.02 | 291,033 | 0.29 |
| Rumania | 81,387 | 81,900 | 222,369 | 224,600 | + 1.0 | 1.33 | 1.25 | 1,712,673 | 1.67 |
| U.S.S.R. (Russia) | 571,208 | 802,000 | 1,560,678 | 2,197,000 | + 40.8 | 9.36 | 12.29 | 9,834,856 | 9.60 |
| Yugoslavia | 1,982 | 2,665 | 5,415 | 7,281 | + 34.5 | 0.04 | 0.04 | 14,081 | 0.02 |
| **Africa** | **13,249** | **18,604** | **36,199** | **50,970** | **+ 40.8** | **0.22** | **0.28** | **267,254** | **0.26** |
| Algeria | 293 | 187 | 801 | 512 | — 36.1 | 0.01 | ..... | 2,701 | ..... |
| Egypt | 12,174 | 16,476 | 33,263 | 45,140 | + 35.7 | 0.20 | 0.25 | 257,209 | 0.25 |
| French Equatorial Africa | ..... | 1,282 | ..... | 3,511 | ..... | ..... | 0.02 | 1,282 | ..... |
| Morocco | 720 | 566 | 1,967 | 1,550 | — 21.2 | 0.01 | 0.01 | 5,907 | 0.01 |
| Nigeria | ..... | 9 | ..... | 880 | ..... | ..... | ..... | 9 | ..... |
| Angola | 62 | 84 | 169 | 231 | + 36.7 | ..... | ..... | 146 | ..... |
| **Asia, Total** | **1,431,744** | **1,470,733** | **3,922,586** | **4,029,405** | **+ 3.0** | **23.46** | **22.52** | **14,117,099** | **13.78** |
| **Asia, Middle East** | **1,262,943** | **1,291,657** | **3,450,664** | **3,538,786** | **+ 2.6** | **20.70** | **19.78** | **11,099,413** | **10.84** |
| Bahrain | 11,014 | 11,691 | 30,093 | 32,031 | + 6.4 | 0.18 | 0.18 | 198,571 | 0.19 |
| Iran | 198,289 | 261,340 | 541,774 | 716,000 | + 32.2 | 3.25 | 4.00 | 3,127,729 | 3.05 |
| Iraq | 233,421 | 163,498 | 637,762 | 447,940 | — 29.8 | 3.83 | 2.51 | 1,784,966 | 1.75 |
| Israel | 152 | 400 | 415 | 1,096 | +164.1 | ..... | ..... | 552 | ..... |
| Kuwait | 399,874 | 416,000 | 1,092,552 | 1,139,726 | + 4.3 | 6.55 | 6.37 | 2,638,999 | 2.57 |
| Neutral Zone | 11,725 | 23,200 | 32,036 | 63,562 | — 98.4 | 0.19 | 0.35 | 49,768 | 0.05 |
| Qatar | 45,345 | 51,356 | 123,893 | 140,701 | + 13.6 | 0.74 | 0.79 | 262,441 | 0.26 |
| Saudi Arabia | 360,923 | 362,121 | 986,129 | 992,114 | + 0.6 | 5.91 | 5.55 | 3,029,853 | 2.96 |
| Turkey | 2,200 | 2,051 | 6,011 | 5,619 | — 6.5 | 0.04 | 0.03 | 6,534 | ..... |
| **Asia, Far East** | **168,801** | **179,076** | **461,205** | **490,619** | **+ 6.4** | **2.76** | **2.74** | **3,017,686** | **2.94** |
| Burma | 1,680 | 2,610 | 4,590 | 7,150 | + 55.8 | 0.03 | 0.04 | ..... | ..... |
| India | 2,876 | 3,407 | 7,858 | 5,335 | + 18.8 | 0.04 | 0.06 | 383,134 | 0.38 |
| Pakistan | 2,114 | 1,984 | 5,776 | 5,435 | — 5.9 | 0.04 | 0.03 | ..... | ..... |
| China | 11,000 | 10,200 | 30,055 | 27,945 | — 7.0 | 0.18 | 0.15 | 35,927 | 0.03 |
| Indonesia | 93,820 | 114,283 | 256,339 | 313,105 | + 22.1 | 1.54 | 1.75 | 1,834,387 | 1.79 |
| Japan | 2,169 | 2,243 | 5,926 | 6,145 | + 3.7 | 0.03 | 0.03 | 113,782 | 0.11 |
| New Guinea | 2,618 | 2,294 | 7,154 | 6,286 | — 12.1 | 0.04 | 0.03 | 21,201 | 0.03 |
| Sakhalin | 7,000 | n.a. | 19,126 | n.a. | n.a. | 0.12 | n.a. | 137,740 | 0.13 |
| Sarawak-Brunei (Br. Borneo) | 45,503 | 42,038 | 124,325 | 115,172 | — 7.4 | 0.74 | 0.65 | 491,054 | 0.48 |
| Taiwan (Formosa) | 21 | 17 | 57 | 48 | — 15.8 | ..... | ..... | 461 | ..... |
| **Australia-New Zealand** | **18** | **5** | **49** | **13** | **— 73.5** | ..... | ..... | **113** | ..... |
| **World, Undistributed** | ..... | ..... | ..... | ..... | ..... | ..... | ..... | **1,044** | ..... |
| **Total World** | **6,101,787** | **6,529,770** | **16,671,549** | **17,889,781** | **+ 7.3** | **100.0** | **100.0** | **102,419,127** | **100.0** |

* Includes absorption liquids.

† Includes 1956 and 1957 production from East Germany.

# World Crude Oil Production, By Countries, By Years (Part 1)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: U. S. Bureau of Mines annual reports, *Mineral Resources and Minerals Yearbook*, and monthly reports, International Petroleum Trade and World Petroleum Statistics, except as otherwise indicated.)

## World and North America, 1857-1895

| YEAR | World Total | Percent Produced by U. S. | Canada | United States | Total North America | YEAR | World Total | Percent Produced by U. S. | Canada | United States | Total North America |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857 | 2 | .... | .... | .... | .... | 1876 | 11,051 | 83 | 312 | 9,133 | 9,445 |
| 1858 | 4 | .... | .... | .... | .... | 1877 | 15,754 | 85 | 312 | 13,350 | 13,662 |
| 1859 | 6 | 31 | .... | 2 | 2 | 1878 | 18,417 | 84 | 312 | 15,397 | 15,709 |
| 1860 | 500 | 98 | .... | 500 | 500 | 1879 | 23,601 | 84 | 575 | 19,914 | 20,489 |
| 1861 | 2,131 | 99 | .... | 2,114 | 2,114 | 1880 | 30,018 | 88 | 350 | 26,286 | 26,636 |
| 1862 | 3,092 | 99 | 12 | 3,057 | 3,069 | 1881 | 31,993 | 86 | 275 | 27,661 | 27,936 |
| 1863 | 2,763 | 94 | 83 | 2,611 | 2,694 | 1882 | 35,704 | 85 | 275 | 30,350 | 30,625 |
| 1864 | 2,304 | 92 | 90 | 2,116 | 2,206 | 1883 | 30,255 | 78 | 250 | 23,450 | 23,700 |
| 1865 | 2,716 | 92 | 110 | 2,498 | 2,608 | 1884 | 35,969 | 67 | 250 | 24,218 | 24,468 |
| 1866 | 3,899 | 92 | 175 | 3,598 | 3,773 | 1885 | 36,765 | 59 | 250 | 21,859 | 22,109 |
| 1867 | 3,709 | 90 | 190 | 3,347 | 3,537 | 1886 | 47,243 | 59 | 584 | 28,065 | 28,649 |
| 1868 | 3,990 | 91 | 200 | 3,646 | 3,846 | 1887 | 47,807 | 59 | 526 | 28,283 | 28,809 |
| 1869 | 4,696 | 90 | 220 | 4,215 | 4,435 | 1888 | 52,165 | 53 | 695 | 27,612 | 28,307 |
| 1870 | 5,799 | 91 | 250 | 5,261 | 5,511 | 1889 | 61,507 | 57 | 705 | 35,164 | 35,869 |
| 1871 | 5,730 | 91 | 270 | 5,205 | 5,475 | 1890 | 76,633 | 60 | 795 | 45,824 | 46,619 |
| 1872 | 6,877 | 92 | 308 | 6,293 | 6,601 | 1891 | 91,100 | 60 | 755 | 54,293 | 55,048 |
| 1873 | 10,838 | 91 | 365 | 9,894 | 10,259 | 1892 | 88,739 | 57 | 780 | 50,515 | 51,295 |
| 1874 | 11,933 | 92 | 169 | 10,927 | 11,096 | 1893 | 92,038 | 53 | 798 | 48,431 | 49,229 |
| 1875 | 9,977 | 88 | 220 | 8,788 | 9,008 | 1894 | 89,337 | 55 | 829 | 49,344 | 50,173 |
| | | | | | | 1895 | 103,692 | 51 | 726 | 52,892 | 53,618 |

## World and North America, 1896 to Now

| YEAR | WORLD TOTAL | Percent Produced by U.S. | NORTH AMERICA | | | | |
|---|---|---|---|---|---|---|---|
| | | | Canada | Mexico | United States | Cuba | Total North America |
| 1896 | 114,199 | 53 | 727 | ..... | 60,960 | ..... | 61,687 |
| 1897 | 121,993 | 50 | 710 | ..... | 60,476 | ..... | 61,186 |
| 1898 | 124,979 | 44 | 758 | ..... | 55,364 | ..... | 56,122 |
| 1899 | 131,147 | 44 | 808 | ..... | 57,071 | ..... | 57,879 |
| 1900 | 149,137 | 43 | 913 | ..... | 63,621 | ..... | 64,534 |
| 1901 | 167,440 | 41 | 757 | 10 | 69,389 | ..... | 70,156 |
| 1902 | 181,809 | 49 | 531 | 40 | 88,767 | ..... | 89,338 |
| 1903 | 194,879 | 52 | 487 | 75 | 100,461 | ..... | 101,023 |
| 1904 | 217,948 | 54 | 553 | 126 | 117,081 | ..... | 117,760 |
| 1905 | 215,091 | 63 | 634 | 251 | 134,717 | ..... | 135,602 |
| 1906 | 213,263 | 59 | 569 | 502 | 126,494 | ..... | 127,565 |
| 1907 | 263,957 | 63 | 789 | 1,005 | 166,095 | ..... | 167,889 |
| 1908 | 285,287 | 63 | 528 | 3,933 | 178,527 | ..... | 182,988 |
| 1909 | 298,709 | 61 | 421 | 2,714 | 183,171 | ..... | 186,306 |
| 1910 | 327,763 | 64 | 316 | 3,634 | 209,557 | ..... | 213,507 |
| 1911 | 344,361 | 64 | 291 | 12,553 | 220,449 | ..... | 233,293 |
| 1912 | 352,443 | 63 | 243 | 16,558 | 222,935 | ..... | 239,736 |
| 1913 | 385,345 | 64 | 228 | 25,696 | 248,446 | ..... | 274,370 |
| 1914 | 407,544 | 65 | 215 | 26,235 | 265,763 | ..... | 292,213 |
| 1915 | 432,033 | 65 | 215 | 32,911 | 281,104 | ..... | 314,230 |
| 1916 | 457,500 | 66 | 198 | 40,546 | 300,767 | ..... | 341,511 |
| 1917 | 502,891 | 67 | 214 | 55,293 | 335,316 | ..... | 390,823 |
| 1918 | 503,515 | 71 | 305 | 63,828 | 355,928 | ..... | 420,061 |
| 1919 | 555,875 | 68 | 241 | 87,073 | 378,367 | ..... | 465,681 |
| 1920 | 688,884 | 64 | 196 | 157,069 | 442,929 | ..... | 600,194 |
| 1921 | 766,002 | 62 | 188 | 193,398 | 472,183 | ..... | 665,769 |
| 1922 | 858,898 | 65 | 179 | 182,278 | 557,531 | ..... | 739,988 |
| 1923 | 1,015,736 | 72 | 170 | 149,585 | 732,407 | ..... | 882,162 |
| 1924 | 1,014,318 | 70 | 161 | 139,678 | 713,940 | ..... | 853,779 |
| 1925 | 1,068,933 | 71 | 332 | 115,515 | 763,743 | ..... | 879,590 |
| 1926 | 1,096,823 | 70 | 364 | 90,421 | 770,874 | ..... | 861,659 |
| 1927 | 1,262,582 | 71 | 477 | 64,121 | 901,129 | ..... | 965,727 |
| 1928 | 1,324,774 | 68 | 624 | 50,151 | 901,474 | ..... | 952,249 |
| 1929 | 1,485,867 | 68 | 1,117 | 44,688 | 1,007,323 | ..... | 1,053,128 |
| 1930 | 1,410,037 | 64 | 1,522 | 39,530 | 898,011 | ..... | 939,063 |
| 1931 | 1,372,532 | 62 | 1,543 | 33,039 | 851,081 | ..... | 885,663 |
| 1932 | 1,309,684 | 60 | 1,044 | 32,805 | 785,159 | ..... | 819,008 |
| 1933 | 1,442,153 | 63 | 1,145 | 34,001 | 905,656 | 23 | 940,825 |
| 1934 | 1,522,287 | 60 | 1,417 | 38,172 | 908,065 | 28 | 947,682 |
| 1935 | 1,654,488 | 60 | 1,447 | 40,241 | 996,596 | 47 | 1,038,331 |
| 1936 | 1,791,540 | 61 | 1,500 | 41,028 | 1,099,687 | 62 | 1,142,277 |
| 1937 | 2,039,231 | 63 | 2,944 | 46,907 | 1,279,160 | 33 | 1,329,044 |
| 1938 | 1,988,041 | 61 | 6,966 | 38,506 | 1,214,355 | 78 | 1,259,905 |
| 1939 | 2,086,160 | 60.6 | 7,838 | 42,898 | 1,264,962 | 112 | 1,315,810 |
| 1940 | 2,149,821 | 62.9 | 8,591 | 44,036 | 1,353,214 | 142 | 1,405,983 |
| 1941 | 2,220,657 | 63.1 | 10,134 | 42,196 | 1,402,228 | 150 | 1,454,708 |
| 1942 | 2,093,100 | 66.2 | 10,365 | 34,815 | 1,386,645 | 151 | 1,431,976 |
| 1943 | 2,256,637 | 66.7 | 10,052 | 35,163 | 1,505,613 | 107 | 1,550,935 |
| 1944 | 2,592,289 | 64.7 | 10,099 | 38,203 | 1,677,904 | 109 | 1,726,315 |
| 1945 | 2,594,697 | 66.0 | 8,483 | 43,547 | 1,713,655 | 149 | 1,765,834 |
| 1946 | 2,745,430 | 63.2 | 7,586 | 49,235 | 1,733,939 | 269 | 1,791,029 |
| 1947 | 3,022,139 | 61.4 | 7,692 | 56,284 | 1,856,987 | 300 | 1,921,263 |
| 1948 | 3,433,225 | 58.8 | 12,287 | 58,508 | 2,020,185 | 159 | 2,091,139 |
| 1949 | 3,404,132 | 54.1 | 21,305 | 60,910 | 1,841,940 | 206 | 1,924,361 |
| 1950 | 3,802,995 | 51.9 | 29,044 | 72,443 | 1,973,574 | 156 | 2,075,217 |
| 1951 | 4,282,730 | 52.5 | 47,615 | 77,312 | 2,247,711 | 128 | 2,372,766 |
| 1952 | 4,504,708 | 50.8 | 61,237 | 77,275 | 2,289,836 | 36 | 2,428,384 |
| 1953 | 4,786,989 | 49.2 | 80,899 | 72,440 | 2,357,082 | 17 | 2,510,438 |
| 1954 | 5,006,741 | 46.2 | 96,080 | 83,653 | 2,314,988 | 25 | 2,494,746 |
| 1955 | 5,642,439 | 44.0 | 129,453 | 91,370 | 2,484,428 | 369 | 2,705,620 |
| 1956* | 6,101,787 | 42.9 | 169,321 | 94,096 | 2,617,283 | 543 | 2,881,243 |
| 1957* | 6,529,770 | ..... | 181,813 | 92,197 | 2,618,522 | 395 | 2,892,927 |
| Total | 102,419,127 | ..... | 957,879 | 3,070,697 | 57,848,938 | 3,794 | 61,881,326 |

## South America, Since Beginning in 1896

| YEAR | Argentina | Barbados | Bolivia | Brasil | Chile | Colombia | Ecuador | Peru | Trinidad | Venezuela | Total South America |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1896 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 47 | ..... | ..... | 47 |
| 1897 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 71 | ..... | ..... | 71 |
| 1898 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 71 | ..... | ..... | 71 |
| 1899 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 89 | ..... | ..... | 89 |
| 1900 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 274 | ..... | ..... | 274 |
| 1901 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 275 | ..... | ..... | 275 |
| 1902 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 287 | ..... | ..... | 287 |
| 1903 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 278 | ..... | ..... | 278 |
| 1904 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 290 | ..... | ..... | 290 |
| 1905 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 373 | ..... | ..... | 373 |
| 1906 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 531 | ..... | ..... | 531 |
| 1907 | B | ..... | ..... | ..... | ..... | ..... | ..... | 751 | ..... | ..... | 751 |
| 1908 | 12 | ..... | ..... | ..... | ..... | ..... | ..... | 945 | B | ..... | 957 |
| 1909 | 18 | ..... | ..... | ..... | ..... | ..... | ..... | 1,411 | 57 | ..... | 1,468 |
| 1910 | 20 | ..... | ..... | ..... | ..... | ..... | ..... | 1,258 | 143 | ..... | 1,421 |
| 1911 | 13 | ..... | ..... | ..... | ..... | ..... | ..... | 1,465 | 285 | ..... | 1,763 |
| 1912 | 47 | ..... | ..... | ..... | ..... | ..... | ..... | 1,752 | 437 | ..... | 2,236 |
| 1913 | 131 | ..... | ..... | ..... | ..... | ..... | ..... | 2,071 | 504 | ..... | 2,706 |
| 1914 | 276 | ..... | ..... | ..... | ..... | ..... | ..... | 1,837 | 644 | ..... | 2,757 |
| 1915 | 513 | ..... | ..... | ..... | ..... | ..... | ..... | 2,579 | 750 | ..... | 3,843 |
| 1916 | 867 | ..... | ..... | ..... | ..... | ..... | ..... | 2,593 | 929 | ..... | 4,389 |
| 1917 | 1,218 | ..... | ..... | ..... | ..... | ..... | 57 | 2,577 | 1,602 | 120 | 5,574 |
| 1918 | 1,353 | ..... | ..... | ..... | ..... | ..... | C60 | 2,527 | 2,082 | 333 | 6,355 |
| 1919 | 1,331 | ..... | ..... | ..... | ..... | ..... | C60 | 2,628 | 1,841 | 425 | 6,285 |
| 1920 | 1,651 | ..... | ..... | ..... | ..... | ..... | C60 | 2,817 | 2,083 | 457 | 7,068 |
| 1921 | 2,036 | ..... | ..... | ..... | ..... | 67 | C60 | 3,699 | 2,354 | 1,433 | 9,649 |
| 1922 | 2,866 | ..... | ..... | ..... | ..... | 323 | C60 | 5,314 | 2,445 | 2,201 | 13,209 |
| 1923 | 3,400 | ..... | ..... | ..... | ..... | 425 | 87 | 5,699 | 3,051 | 4,201 | 16,863 |
| 1924 | 4,639 | ..... | ..... | ..... | ..... | 445 | C100 | 8,379 | 4,057 | 9,042 | 26,662 |
| 1925 | 6,236 | ..... | ..... | ..... | ..... | 1,007 | 160 | 9,232 | 4,387 | 19,687 | 40,809 |
| 1926 | 7,851 | ..... | ..... | ..... | ..... | 6,444 | 214 | 10,762 | 4,971 | 36,911 | 67,153 |
| 1927 | 8,630 | ..... | ..... | ..... | ..... | 15,014 | 537 | 10,127 | 5,380 | 63,134 | 102,822 |
| 1928 | 9,070 | ..... | ..... | ..... | ..... | 19,897 | 1,084 | 12,006 | 7,684 | 105,749 | 155,490 |
| 1929 | 9,391 | ..... | B | ..... | ..... | 20,385 | 1,381 | 13,422 | 8,716 | 137,472 | 190,767 |
| 1930 | 9,002 | ..... | 56 | ..... | ..... | 20,346 | 1,553 | 12,449 | 9,419 | 136,669 | 189,494 |
| 1931 | 11,709 | ..... | 25 | ..... | ..... | 18,237 | 1,762 | 10,089 | 9,744 | 116,613 | 168,179 |
| 1932 | 13,139 | ..... | 44 | ..... | ..... | 16,414 | 1,597 | 9,899 | 10,126 | 116,541 | 167,760 |
| 1933 | 13,691 | ..... | 112 | ..... | ..... | 13,158 | 1,620 | 13,257 | 9,561 | 117,720 | 169,119 |
| 1934 | 14,024 | ..... | 159 | ..... | ..... | 17,341 | 1,637 | 16,314 | 10,894 | 136,103 | 196,472 |
| 1935 | 14,297 | ..... | 164 | ..... | ..... | 17,598 | 1,732 | 17,067 | 11,671 | 148,254 | 210,783 |
| 1936 | 15,458 | ..... | 105 | ..... | ..... | 18,756 | 1,942 | 17,593 | 13,237 | 154,794 | 221,885 |
| 1937 | 16,355 | ..... | 122 | ..... | ..... | 20,599 | 2,161 | 17,457 | 15,503 | 186,230 | 258,427 |
| 1938 | 17,076 | ..... | 226 | ..... | ..... | 21,582 | 2,246 | 15,839 | 17,737 | 188,174 | 262,880 |
| 1939 | 18,613 | ..... | 215 | ..... | ..... | 23,857 | 2,313 | 13,508 | 19 270 | 206,470 | 284,246 |
| 1940 | 20,609 | ..... | 288 | 2 | ..... | 25,593 | 2,349 | 12,126 | 22,227 | 185,570 | 268,764 |
| 1941 | 21,873 | ..... | 235 | 3 | ..... | 24,553 | 1,557 | 11,935 | 20,506 | 228,430 | 309,092 |
| 1942 | 22,704 | 2 | 308 | 33 | ..... | 10,487 | 2,278 | 13,629 | 22,069 | 147,675 | 220,185 |
| 1943 | 27,714 | 2 | 334 | 48 | ..... | 13,261 | 2,315 | 14,654 | 21,385 | 177,631 | 257,344 |
| 1944 | 24,230 | 1 | 314 | 58 | ..... | 22,291 | 2,967 | 14,389 | 22,139 | 257,046 | 343,435 |
| 1945 | 22,881 | 2 | 382 | 79 | ..... | 22,449 | 2,664 | 13,744 | 21,093 | 323,156 | 406,450 |
| 1946 | 20,604 | 1 | 363 | 67 | ..... | 22,118 | 2,323 | 12,468 | 20,233 | 388,486 | 466,683 |
| 1947 | 21,846 | B | 377 | 97 | ..... | 24,794 | 2,282 | 12,764 | 20,521 | 434,905 | 517,586 |
| 1948 | 23,734 | ..... | 464 | 144 | ..... | 23,792 | 2,563 | 14,069 | 20,111 | 490,015 | 574,892 |
| 1949 | 22,589 | ..... | 678 | 109 | ..... | 29,722 | 2,617 | 14,796 | 20,617 | 482,316 | 573,444 |
| 1950 | 23,353 | ..... | 616 | 339 | 629 | 34,060 | 2,632 | 15,012 | 20,632 | 546,783 | 644,056 |
| 1951 | 24,465 | ..... | 523 | 691 | 760 | 38,398 | 2,708 | 16,110 | 20,843 | 622,216 | 726,714 |
| 1952 | 24,588 | ..... | 526 | 750 | 910 | 38,683 | 2,839 | 16,403 | 21,258 | 660,254 | 766,211 |
| 1953 | 28,501 | ..... | 601 | 916 | 1,258 | 40,179 | 2,967 | 15,999 | 22,346 | 644,243 | 757,010 |
| 1954 | 29,650 | ..... | 1,695 | 992 | 1,736 | 40,547 | 3,146 | 17,161 | 23,629 | 691,808 | 810,364 |
| 1955 | 30,501 | ..... | 2,693 | 2,022 | 2,574 | 40,492 | 3,531 | 17,244 | 24,896 | 787,413 | 911,366 |
| 1956* | 31,717 | ..... | 3,196 | 4,059 | 3,542 | 43,819 | 3,394 | 18,383 | 28,929 | 899,183 | 1,036,222 |
| 1957* | 33,855 | ..... | 3,575 | 10,106 | 4,337 | 45,738 | 3,191 | 19,222 | 34,063 | 1,014,424 | 1,168,511 |
| Total | 661,447 | 8 | 18,396 | 20,515 | 15,746 | 792,871 | 70,806 | 522,017 | 589,061 | 10,870,287 | 13,561,154 |

B Less than 1,000 barrels. C Estimated production. * WORLD OIL from private sources.

# World Crude Oil Production, By Countries, By Years (Part 2)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: U. S. Bureau of Mines annual reports, *Mineral Resources and Minerals Yearbook*, and monthly reports, International Petroleum Trade and World Petroleum Statistics, except as otherwise indicated.)

## Asia, Total, and Asia, Far East, Since Beginning in 1875

| YEAR | [F]Total Asia | ASIA — Far East | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [E]Burma-India Pakistan | | | | | | | | | | |
| | | Burma | Pakistan | India | China | Indonesia | Japan | New Guinea | Sakhalin | Sarawak Brunei | Formosa | Total Far East |
| 1874 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 1875 | 5 | ..... | ..... | ..... | ..... | ..... | 5 | ..... | ..... | ..... | ..... | 5 |
| 1876 | 7 | ..... | ..... | ..... | ..... | ..... | 7 | ..... | ..... | ..... | ..... | 7 |
| 1877 | 10 | ..... | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | 10 |
| 1878 | 18 | ..... | ..... | ..... | ..... | ..... | 18 | ..... | ..... | ..... | ..... | 18 |
| 1879 | 23 | ..... | ..... | ..... | ..... | ..... | 23 | ..... | ..... | ..... | ..... | 23 |
| 1880 | 26 | ..... | ..... | ..... | ..... | ..... | 26 | ..... | ..... | ..... | ..... | 26 |
| 1881 | 17 | ..... | ..... | ..... | ..... | ..... | 17 | ..... | ..... | ..... | ..... | 17 |
| 1882 | 15 | ..... | ..... | ..... | ..... | ..... | 15 | ..... | ..... | ..... | ..... | 15 |
| 1883 | 20 | ..... | ..... | ..... | ..... | ..... | 20 | ..... | ..... | ..... | ..... | 20 |
| 1884 | 28 | ..... | ..... | ..... | ..... | ..... | 28 | ..... | ..... | ..... | ..... | 28 |
| 1885 | 30 | ..... | ..... | ..... | ..... | ..... | 30 | ..... | ..... | ..... | ..... | 30 |
| 1886 | 38 | ..... | ..... | ..... | ..... | ..... | 38 | ..... | ..... | ..... | ..... | 38 |
| 1887 | 29 | ..... | ..... | ..... | ..... | ..... | 29 | ..... | ..... | ..... | ..... | 29 |
| 1888 | 37 | ..... | ..... | ..... | ..... | ..... | 37 | ..... | ..... | ..... | ..... | 37 |
| 1889 | 147 | | 94 | | ..... | ..... | 53 | ..... | ..... | ..... | ..... | 147 |
| 1890 | 170 | | 118 | | ..... | ..... | 52 | ..... | ..... | ..... | ..... | 170 |
| 1891 | 243 | | 190 | | ..... | ..... | 53 | ..... | ..... | ..... | ..... | 243 |
| 1892 | 311 | | 242 | | ..... | ..... | 69 | ..... | ..... | ..... | ..... | 311 |
| 1893 | 1,005 | | 299 | | ..... | 600 | 106 | ..... | ..... | ..... | ..... | 1,005 |
| 1894 | 1,188 | | 327 | | ..... | 688 | 173 | ..... | ..... | ..... | ..... | 1,188 |
| 1895 | 1,758 | | 372 | | ..... | 1,216 | 170 | ..... | ..... | ..... | ..... | 1,758 |
| 1896 | 2,094 | | 430 | | ..... | 1,427 | 237 | ..... | ..... | ..... | ..... | 2,094 |
| 1897 | 3,360 | | 546 | | ..... | 2,552 | 262 | ..... | ..... | ..... | ..... | 3,360 |
| 1898 | 3,825 | | 542 | | ..... | 2,964 | 319 | ..... | ..... | ..... | ..... | 3,825 |
| 1899 | 3,276 | | 941 | | ..... | 1,796 | 539 | ..... | ..... | ..... | ..... | 3,276 |
| 1900 | 4,203 | | 1,079 | | ..... | 2,253 | 871 | ..... | ..... | ..... | ..... | 4,203 |
| 1901 | 6,562 | | 1,431 | | ..... | 4,014 | 1,117 | ..... | ..... | ..... | ..... | 6,562 |
| 1902 | 5,043 | | 1,617 | | ..... | 2,430 | 996 | ..... | ..... | ..... | ..... | 5,043 |
| 1903 | 9,489 | | 2,510 | | ..... | 5,770 | 1,209 | ..... | ..... | ..... | ..... | 9,489 |
| 1904 | 11,112 | | 3,385 | | ..... | 6,508 | 1,219 | ..... | ..... | ..... | ..... | 11,112 |
| 1905 | 13,334 | | 4,137 | | ..... | 7,850 | 1,347 | ..... | ..... | ..... | ..... | 13,334 |
| 1906 | 13,761 | | 4,016 | | ..... | 8,181 | 1,564 | ..... | ..... | ..... | ..... | 13,761 |
| 1907 | 16,045 | | 4,344 | | ..... | 9,983 | 1,718 | ..... | ..... | ..... | ..... | 16,045 |
| 1908 | 17,201 | | 5,047 | | ..... | 10,283 | 1,871 | ..... | ..... | ..... | ..... | 17,201 |
| 1909 | 19,606 | | 6,677 | | ..... | 11,042 | 1,887 | ..... | ..... | ..... | ..... | 19,606 |
| 1910 | 18,998 | | 6,138 | | ..... | 11,031 | 1,829 | ..... | ..... | ..... | ..... | 18,998 |
| 1911 | 20,361 | | 6,451 | | ..... | 12,173 | 1,737 | ..... | ..... | ..... | ..... | 20,361 |
| 1912 | 19,622 | | 7,117 | | ..... | 10,846 | 1,659 | ..... | ..... | ..... | ..... | 19,622 |
| 1913 | 23,040 | | 7,930 | | ..... | 11,172 | 1,940 | ..... | ..... | 141 | ..... | 21,183 |
| 1914 | 24,696 | | 7,410 | | ..... | 11,422 | 2,636 | ..... | ..... | 318 | ..... | 21,786 |
| 1915 | 27,058 | | 8,202 | | ..... | 11,920 | 2,928 | ..... | ..... | 392 | ..... | 23,442 |
| 1916 | 29,107 | | 8,491 | | ..... | 12,547 | 2,963 | ..... | ..... | 629 | ..... | 24,630 |
| 1917 | 31,809 | | 8,079 | | ..... | 13,180 | 2,861 | ..... | ..... | 542 | ..... | 24,662 |
| 1918 | 32,534 | | 8,188 | | ..... | 12,778 | 2,441 | ..... | ..... | 504 | ..... | 23,911 |
| 1919 | 37,217 | | 8,736 | | ..... | 15,508 | 2,238 | ..... | ..... | 596 | ..... | 27,078 |
| 1920 | 41,375 | | 8,375 | | ..... | 17,529 | 2,221 | ..... | ..... | 1,020 | ..... | 29,145 |
| 1921 | 46,011 | | 8,734 | | ..... | 16,958 | 2,233 | ..... | 2 | 1,411 | ..... | 29,338 |
| 1922 | 52,753 | | 8,529 | | ..... | 17,066 | 2,055 | ..... | 7 | 2,849 | ..... | 30,506 |
| 1923 | 59,259 | | 8,406 | | ..... | 19,870 | 1,804 | ..... | 9 | 3,940 | ..... | 34,029 |
| 1924 | 67,319 | | 8,416 | | ..... | 20,473 | 1,814 | ..... | 80 | 4,163 | ..... | 34,946 |
| 1925 | 70,993 | | 8,274 | | ..... | 21,422 | 1,915 | ..... | 87 | 4,257 | ..... | 35,955 |
| 1926 | 72,004 | | 8,011 | | ..... | 21,243 | 1,785 | ..... | 181 | 4,942 | ..... | 36,162 |
| 1927 | 82,689 | | 8,032 | | ..... | 27,459 | 1,789 | ..... | 440 | 4,943 | ..... | 42,663 |
| 1928 | 92,877 | | 8,741 | | ..... | 32,118 | 1,944 | ..... | 677 | [G]5,223 | ..... | 48,703 |
| 1929 | 99,416 | | 8,747 | | ..... | 39,279 | 2,023 | ..... | [D]1,134 | 5,290 | ..... | 56,473 |
| 1930 | 105,424 | | 8,292 | | ..... | 41,729 | 1,950 | ..... | [D]1,805 | 4,907 | ..... | 58,683 |
| 1931 | 97,583 | | 8,200 | | ..... | 35,539 | 2,050 | ..... | 2,734 | 3,854 | ..... | 52,377 |
| 1932 | 106,182 | | 8,817 | | ..... | 39,001 | 1,630 | ..... | 2,631 | 3,796 | ..... | 55,875 |
| 1933 | 114,972 | | 8,743 | | ..... | 42,606 | 1,455 | ..... | 2,338 | 4,490 | ..... | 59,632 |
| 1934 | 133,108 | | 10,503 | | ..... | 46,925 | 1,834 | ..... | 2,881 | 5,140 | ..... | 67,283 |
| 1935 | 152,676 | 7,181 | [B] | 2,038 | ..... | 47,171 | 2,249 | ..... | 2,545 | 5,546 | ..... | 66,730 |
| 1936 | 168,241 | 7,588 | [B] | 1,978 | ..... | 50,025 | 2,440 | ..... | 3,212 | 5,209 | ..... | 70,452 |
| 1937 | 196,354 | 7,848 | [B] | 2,162 | ..... | 56,724 | 2,488 | ..... | 3,656 | 6,009 | ..... | 78,887 |
| 1938 | 200,397 | 7,538 | [B] | 2,488 | ..... | 57,318 | 2,511 | ..... | [C]3,821 | 6,913 | ..... | 80,589 |
| 1939 | 206,507 | 7,873 | [B] | 2,327 | 4 | 62,087 | 2,654 | ..... | 4,000 | 7,097 | ..... | 86,042 |
| 1940 | 188,431 | 7,731 | [B] | 2,302 | 10 | 62,011 | 2,639 | ..... | 4,000 | 7,047 | [H] | 85,740 |
| 1941 | 151,838 | 7,762 | [B] | 2,899 | 87 | 53,704 | 1,929 | ..... | 4,000 | 6,864 | 62 | 77,307 |
| 1942 | 141,085 | 2,500 | [B] | 2,792 | 340 | 24,000 | 1,652 | ..... | 4,000 | 3,000 | 48 | 38,332 |
| 1943 | 174,641 | 1,000 | [B] | 2,735 | 447 | 48,294 | 1,727 | ..... | 5,000 | 4,500 | 38 | 63,741 |
| 1944 | 186,436 | 750 | [B] | 2,784 | 505 | 22,260 | 1,601 | ..... | 5,000 | 6,000 | 40 | 38,940 |
| 1945 | 215,088 | 725 | [B] | 2,363 | 484 | 7,600 | 1,544 | ..... | 6,000 | 2,100 | 14 | 20,830 |
| 1946 | 270,599 | 15 | [B] | 2,193 | 513 | 2,100 | 1,343 | ..... | 6,000 | 2,050 | 16 | 14,230 |
| 1947 | 338,260 | 59 | 356 | 1,863 | 374 | 8,020 | 1,276 | ..... | [C]7,000 | 12,970 | 22 | 31,940 |
| 1948 | 480,188 | 341 | 490 | 1,875 | 533 | 31,765 | 1,122 | 135 | 7,000 | 20,124 | 23 | 63,408 |
| 1949 | 593,737 | 248 | 931 | 1,906 | 730 | 43,206 | 1,353 | 1,726 | 7,000 | 25,108 | 22 | 82,230 |
| 1950 | 735,519 | 532 | 1,281 | 1,867 | 800 | 48,400 | 2,048 | 1,748 | 7,000 | 30,958 | 23 | 94,657 |
| 1951 | 809,754 | 851 | 1,348 | 1,949 | 900 | 55,453 | 2,337 | 1,746 | 7,000 | 37,506 | 21 | 109,111 |
| 1952 | 877,571 | 869 | 1,580 | 1,900 | 1,000 | 62,495 | 2,134 | 1,725 | 7,000 | 38,251 | 18 | 116,972 |
| 1953 | 1,014,607 | 1,051 | 1,762 | 2,215 | 1,500 | 75,626 | 2,101 | 1,751 | 7,000 | 36,848 | 17 | 129,871 |
| 1954 | 1,137,562 | 1,345 | 1,945 | 2,235 | 3,000 | 79,586 | 2,124 | 4,045 | 8,000 | 36,315 | 35 | 138,630 |
| 1955 | 1,334,688 | 1,592 | 2,068 | 2,526 | 3,500 | 87,088 | 2,229 | 3,413 | 7,500 | 39,751 | 24 | 149,691 |
| 1956* | 1,431,744 | 1,680 | 2,114 | 2,876 | 11,000 | 93,820 | 2,169 | 2,618 | 7,000 | 45,503 | 21 | 168,801 |
| 1957* | 1,470,733 | 2,610 | 1,984 | 3,407 | 10,200 | 114,283 | 2,243 | 2,294 | ..... | 42,038 | 17 | 179,076 |
| Total | 14,117,099 | | 383,134 | | 35,927 | 1,834,387 | 113,782 | 21,201 | 137,740 | 491,054 | 461 | 3,017,686 |

## Asia, Middle East, Newer Fields, 1946 to Now

| YEAR | Israel | Kuwait | Neutral Zone | Qatar | Turkey | Total Newer Fields |
|---|---|---|---|---|---|---|
| 1941 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1942 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1943 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1944 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1945 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1946 | ..... | 5,931 | ..... | ..... | ..... | 5,931 |
| 1947 | ..... | 16,225 | ..... | ..... | ..... | 16,225 |
| 1948 | ..... | 46,500 | ..... | ..... | 13 | 46,513 |
| 1949 | ..... | 90,000 | ..... | 750 | 95 | 90,845 |
| 1950 | ..... | 125,722 | ..... | 12,268 | 108 | 138,098 |
| 1951 | ..... | 204,910 | ..... | 18,009 | 133 | 223,052 |
| 1952 | ..... | 273,433 | ..... | 25,255 | 146 | 298,834 |
| 1953 | ..... | 314,592 | ..... | 31,025 | 179 | 345,796 |
| 1954 | ..... | 347,319 | 5,995 | 36.450 | 399 | 390,163 |
| 1955 | ..... | 398,493 | 8,848 | 41,983 | 1,210 | 450,534 |
| 1956* | 152 | 399,874 | 11,725 | 45,345 | 2,200 | 459,296 |
| 1957* | 400 | 416,000 | 23,200 | 51,356 | 2,051 | 493,007 |
| Total | 552 | 2,638,999 | 49,768 | 262,441 | 6,534 | 2,958,294 |

## Asia, Middle East, Total and Asia, Middle East, Older Fields, 1913 to Now

| YEAR | Middle East Total | MIDDLE EAST OLDER FIELDS | | | | |
|---|---|---|---|---|---|---|
| | | Bahrain | Iran | Iraq | Saudi Arabia | Total Older Fields |
| 1911 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1912 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1913 | 1,857 | ..... | 1,857 | ..... | ..... | 1,857 |
| 1914 | 2,910 | ..... | 2,910 | ..... | ..... | 2,910 |
| 1915 | 3,616 | ..... | 3,616 | ..... | ..... | 3,616 |
| 1916 | 4,477 | ..... | 4,477 | ..... | ..... | 4,477 |
| 1917 | 7,147 | ..... | 7,147 | ..... | ..... | 7,147 |
| 1918 | 8,623 | ..... | 8,623 | ..... | ..... | 8,623 |
| 1919 | 10,139 | ..... | 10,139 | ..... | ..... | 10,139 |
| 1920 | 12,230 | ..... | 12,230 | ..... | ..... | 12,230 |
| 1921 | 16,673 | ..... | 16,673 | ..... | ..... | 16,673 |
| 1922 | 22,247 | ..... | 22,247 | ..... | ..... | 22,247 |
| 1923 | 25,230 | ..... | 25,230 | ..... | ..... | 25,230 |
| 1924 | 32,373 | ..... | 32,373 | ..... | ..... | 32,373 |
| 1925 | 35,038 | ..... | 35,038 | ..... | ..... | 35,038 |
| 1926 | 35,842 | ..... | 35,842 | ..... | ..... | 35,842 |
| 1927 | 40,026 | ..... | 39,688 | 338 | ..... | 40,026 |
| 1928 | 44,174 | ..... | 43,461 | 713 | ..... | 44,174 |
| 1929 | 42,943 | ..... | 42,145 | 798 | ..... | 42,943 |
| 1930 | 46,741 | ..... | 45,828 | 913 | ..... | 46,741 |
| 1931 | 45,206 | ..... | 44,376 | 830 | ..... | 45,206 |
| 1932 | 50,307 | ..... | 49,471 | 836 | ..... | 50,307 |
| 1933 | 55,340 | 31 | 54,392 | 917 | ..... | 55,340 |
| 1934 | 65,825 | 285 | 57,851 | 7,689 | ..... | 65,825 |
| 1935 | 85,946 | 1,265 | 57,273 | 27,408 | ..... | 85,946 |
| 1936 | 97,789 | 4,645 | 62,718 | 30,406 | 20 | 97,789 |
| 1937 | 117,467 | 7,762 | 77,804 | 31,836 | 65 | 117,467 |
| 1938 | 119,808 | 8,298 | 78,372 | 32,643 | 495 | 119,808 |
| 1939 | 120,465 | 7,589 | 78,151 | 30,791 | 3,934 | 120,465 |
| 1940 | 102,691 | 7,074 | 66,317 | 24,225 | 5,075 | 102,691 |
| 1941 | 74,531 | 6,794 | 50,777 | 12,650 | 4,310 | 74,531 |
| 1942 | 102,753 | 6,241 | 72,256 | 19,726 | 4,530 | 102,753 |
| 1943 | 110,900 | 6,572 | 74,612 | 24,848 | 4,868 | 110,900 |
| 1944 | 147,496 | 6,714 | 102,045 | 30,943 | 7,794 | 147,496 |
| 1945 | 194,258 | 7,309 | 130,526 | 35,112 | 21,311 | 194,258 |
| 1946 | 256,369 | 8,010 | 146,819 | 35,665 | 59,944 | 250,438 |
| 1947 | 306,320 | 9,411 | 154,998 | 35,834 | 89,852 | 290,095 |
| 1948 | 416,780 | 10,915 | 190,384 | 26,115 | 142,853 | 370,267 |
| 1949 | 511,507 | 10,985 | 204,712 | 30,957 | 174,008 | 420,662 |
| 1950 | 640,862 | 11,016 | 242,475 | 49,726 | 199,547 | 502,764 |
| 1951 | 700,643 | 10,994 | 123,512 | 65,122 | 277,963 | 477,591 |
| 1952 | 760,599 | 11,004 | 7,800 | 141,100 | 301,861 | 461,765 |
| 1953 | 884,736 | 10,978 | 9,400 | 210,268 | 308,294 | 538,940 |
| 1954 | 998,932 | 10,992 | 21,500 | 228,432 | 347,845 | 608,769 |
| 1955 | 1,184,997 | 10,982 | 120,035 | 251,206 | 352,240 | 734,463 |
| 1956* | 1,262,943 | 11,014 | 198,289 | 233,421 | 360,923 | 803,647 |
| 1957* | 1,291,657 | 11,691 | 261,340 | 163,498 | 362,121 | 798,650 |
| Total | 11,099,413 | 198,571 | 3,127,729 | 1,784,966 | 3,029,853 | 8,141,119 |

[B] Less than 1,000 barrels. [C] Estimated production [D] Year ended September 30. [E] Separation of British India and Burma prior to 1935 not available from U.S. Bureau of Mines data used here. Data by Dudley Stamp in "Petroleum Development and Technology, 1933" and in A.I.M.E. "Transactions" indicate cumulative through 1934 as follows: Burma 184,528. India 20,756. Pakistan included with India prior to 1947. [F] Exclusive of U.S.S.R. fields in Asia, other than Sakhalin, which are included with U.S.S.R in Europe. [G] Beginning of production in Brunei. [H] Formosa included with Japan prior to 1941. * WORLD OIL from private sources.

# World Crude Oil Production, By Countries, By Years (Part 3)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: U. S. Bureau of Mines annual reports, *Mineral Resources and Minerals Yearbook*, and monthly reports, International Petroleum Trade and World Petroleum Statistics, except as otherwise indicated.)

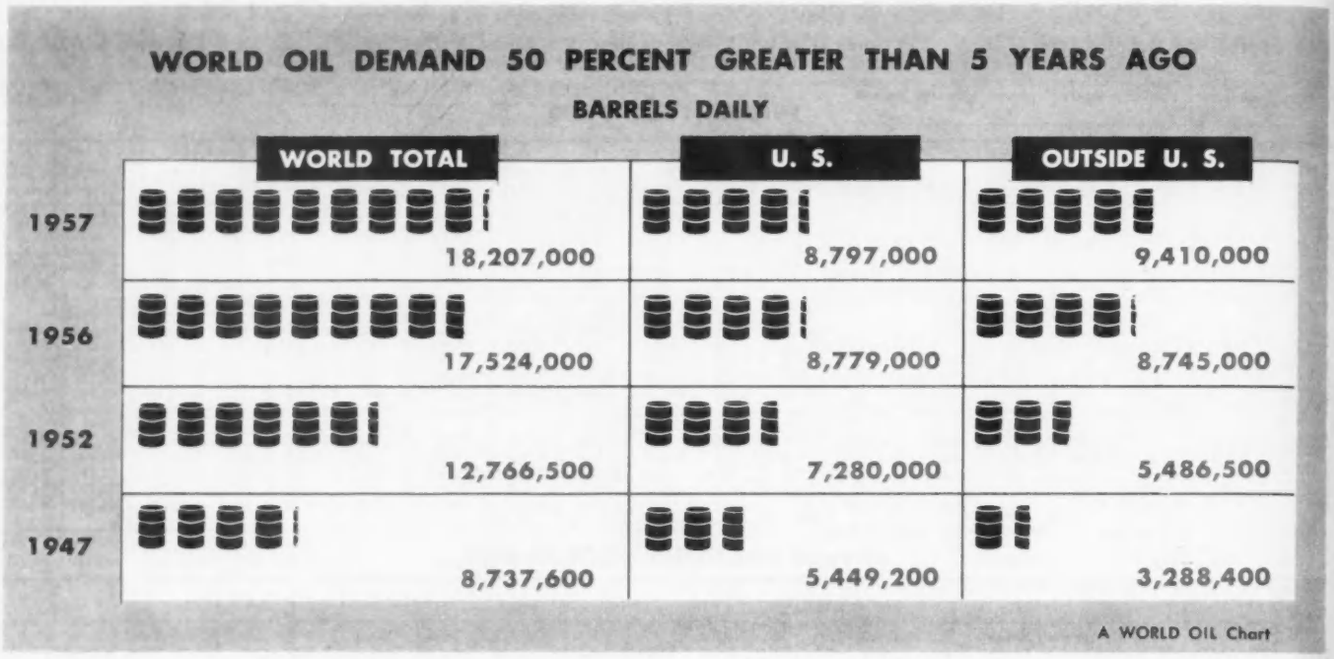
## Europe, 1857-1900

| YEAR | Italy | Rumania | [F] U.S.S.R. (Russia) | [F] Total Europe | YEAR | Germany | Italy | Poland | Rumania | [F] U.S.S.R. (Russia) | [F] Total Europe | YEAR | Germany | Italy | Poland | Rumania | [F] U.S.S.R. (Russia) | [F] Total Europe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1856 | .... | .... | .... | .... | 1871 | .... | [B] | .... | 90 | 165 | 255 | 1886 | 74 | 2 | 306 | 168 | 18,006 | 18,556 |
| 1857 | .... | 2 | .... | 2 | 1872 | .... | [B] | .... | 91 | 185 | 276 | 1887 | 74 | 1 | 344 | 182 | 18,368 | 18,969 |
| 1858 | .... | 4 | .... | 4 | 1873 | .... | [B] | .... | 104 | 475 | 579 | 1888 | 85 | 1 | 467 | 219 | 23,049 | 23,821 |
| 1859 | .... | 4 | .... | 4 | 1874 | .... | 1 | 150 | 103 | 583 | 837 | 1889 | 68 | 1 | 515 | 298 | 24,609 | 25,491 |
| 1860 | .... | 9 | .... | 9 | 1875 | .... | 1 | 158 | 108 | 697 | 964 | 1890 | 108 | 3 | 659 | 383 | 28,691 | 29,844 |
| 1861 | [B] | 17 | .... | 17 | 1876 | .... | 3 | 164 | 111 | 1,321 | 1,599 | 1891 | 109 | 8 | 631 | 488 | 34,573 | 35,809 |
| 1862 | [B] | 23 | .... | 23 | 1877 | .... | 3 | 170 | 108 | 1,801 | 2,082 | 1892 | 101 | 18 | 646 | 593 | 35,775 | 37,133 |
| 1863 | [B] | 28 | 41 | 69 | 1878 | .... | 4 | 176 | 109 | 2,401 | 2,690 | 1893 | 100 | 19 | 693 | 535 | 40,457 | 41,804 |
| 1864 | [B] | 33 | 65 | 98 | 1879 | .... | 3 | 215 | 110 | 2,761 | 3,089 | 1894 | 123 | 21 | 949 | 508 | 36,375 | 37,976 |
| 1865 | 2 | 39 | 67 | 108 | 1880 | 9 | 2 | 229 | 115 | 3,001 | 3,356 | 1895 | 121 | 26 | 1,453 | 576 | 46,140 | 48,316 |
| 1866 | 1 | 42 | 83 | 126 | 1881 | 29 | 1 | 287 | 122 | 3,601 | 4,040 | 1896 | 145 | 18 | 2,444 | 543 | 47,221 | 50,371 |
| 1867 | 1 | 51 | 120 | 172 | 1882 | 58 | 2 | 330 | 136 | 4,538 | 5,064 | 1897 | 166 | 14 | 2,226 | 571 | 54,399 | 57,376 |
| 1868 | [B] | 56 | 88 | 144 | 1883 | 27 | 2 | 365 | 139 | 6,002 | 6,535 | 1898 | 184 | 15 | 2,376 | 776 | 61,610 | 64,961 |
| 1869 | [B] | 59 | 202 | 261 | 1884 | 46 | 3 | 408 | 211 | 10,805 | 11,473 | 1899 | 192 | 16 | 2,314 | 1,426 | 65,955 | 69,903 |
| 1870 | [B] | 84 | 204 | 288 | 1885 | 41 | 2 | 465 | 193 | 13,925 | 14,626 | 1900 | 358 | 12 | 2,347 | 1,629 | 75,780 | 80,126 |

## Europe and Africa, 1901 to Now

| | EUROPE | | | | | | | | | | | | | | AFRICA | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | Albania | Austria | Bulgaria | Czechoslovakia | Great Britain | France | Germany | Hungary | [I] Italy | Netherlands | Poland | Rumania | [F] U.S.S.R. (Russia) | Yugoslavia | [F] Total Europe | Egypt | Algeria | Morocco | Total Africa | Australia-N. Zealand | Rest of World |
| 1901 | ..... | ..... | ..... | ..... | ..... | ..... | 314 | ..... | 16 | ..... | 3,251 | 1,678 | 85,168 | ..... | 90,427 | ..... | ..... | ..... | ..... | ..... | 20 |
| 1902 | ..... | ..... | ..... | ..... | ..... | ..... | 354 | ..... | 19 | ..... | 4,142 | 2,060 | 80,540 | ..... | 87,115 | ..... | ..... | ..... | ..... | ..... | 26 |
| 1903 | ..... | ..... | ..... | ..... | ..... | ..... | 446 | ..... | 18 | ..... | 5,235 | 2,763 | 75,591 | ..... | 84,053 | ..... | ..... | ..... | ..... | ..... | 36 |
| 1904 | ..... | ..... | ..... | ..... | ..... | ..... | 637 | ..... | 26 | ..... | 5,947 | 3,599 | 78,537 | ..... | 88,746 | ..... | ..... | ..... | ..... | ..... | 40 |
| 1905 | ..... | ..... | ..... | ..... | ..... | ..... | 561 | ..... | 44 | ..... | 5,766 | 4,421 | 54,960 | ..... | 65,752 | ..... | ..... | ..... | ..... | ..... | 30 |
| 1906 | ..... | ..... | ..... | ..... | ..... | ..... | 579 | ..... | 54 | ..... | 5,468 | 6,378 | 58,897 | ..... | 71,376 | ..... | ..... | ..... | ..... | ..... | 30 |
| 1907 | ..... | ..... | ..... | ..... | ..... | ..... | 757 | ..... | 60 | ..... | 8,456 | 8,118 | 61,851 | ..... | 79,242 | ..... | ..... | ..... | ..... | ..... | 30 |
| 1908 | ..... | ..... | ..... | ..... | ..... | ..... | 1,009 | ..... | 51 | ..... | 12,612 | 8,252 | 62,187 | ..... | 84,111 | ..... | ..... | ..... | ..... | ..... | 30 |
| 1909 | ..... | ..... | ..... | ..... | ..... | ..... | 1,019 | ..... | 42 | ..... | 14,933 | 9,327 | 65,970 | ..... | 91,291 | ..... | ..... | ..... | ..... | ..... | 20 |
| 1910 | ..... | ..... | ..... | ..... | ..... | ..... | 1,032 | ..... | 51 | ..... | 12,673 | 9,724 | 70,337 | ..... | 93,817 | ..... | ..... | ..... | ..... | ..... | 20 |
| 1911 | ..... | ..... | ..... | ..... | ..... | ..... | 1,017 | ..... | 75 | ..... | 10,519 | 11,108 | 66,184 | ..... | 88,903 | 21 | ..... | ..... | 21 | ..... | 20 |
| 1912 | ..... | ..... | ..... | ..... | ..... | ..... | 1,031 | ..... | 54 | ..... | 8,535 | 12,976 | 68,019 | ..... | 90,615 | 214 | ..... | ..... | 214 | ..... | 20 |
| 1913 | ..... | ..... | ..... | ..... | ..... | ..... | 857 | ..... | 47 | ..... | 7,818 | 13,555 | 62,834 | ..... | 85,111 | 98 | ..... | ..... | 98 | ..... | 20 |
| 1914 | ..... | ..... | ..... | ..... | ..... | ..... | 781 | ..... | 40 | ..... | 6,436 | 12,827 | 67,020 | ..... | 87,104 | 753 | 1 | ..... | 754 | ..... | 20 |
| 1915 | ..... | ..... | ..... | ..... | ..... | ..... | 703 | ..... | 44 | ..... | 5,352 | 12,030 | 68,548 | ..... | 86,677 | 212 | 4 | ..... | 216 | ..... | 10 |
| 1916 | ..... | ..... | ..... | ..... | ..... | ..... | 656 | ..... | 51 | ..... | 6,587 | 8,945 | 65,817 | ..... | 82,056 | 404 | 8 | ..... | 412 | ..... | 25 |
| 1917 | ..... | ..... | ..... | ..... | ..... | ..... | 642 | ..... | 41 | ..... | 6,228 | 3,721 | 63,072 | ..... | 73,704 | 943 | 9 | ..... | 952 | ..... | 29 |
| 1918 | ..... | ..... | ..... | ..... | ..... | 363 | 270 | ..... | 35 | ..... | 6,032 | 8,730 | 27,168 | ..... | 42,598 | 1,935 | 7 | ..... | 1,942 | ..... | 25 |
| 1919 | ..... | ..... | ..... | 48 | 2 | 334 | 265 | ..... | 35 | ..... | 6,096 | 6,618 | 31,752 | ..... | 45,150 | 1,517 | 5 | ..... | 1,522 | ..... | 20 |
| 1920 | ..... | ..... | ..... | 69 | 3 | 356 | 246 | ..... | 35 | ..... | 5,607 | 7,435 | 25,430 | ..... | 39,181 | 1,042 | 4 | ..... | 1,046 | ..... | 20 |
| 1921 | ..... | ..... | ..... | 94 | 3 | 389 | 274 | ..... | 32 | ..... | 5,167 | 8,368 | 28,968 | ..... | 43,295 | 1,255 | 3 | ..... | 1,258 | ..... | 20 |
| 1922 | ..... | ..... | ..... | 120 | 1 | 496 | 319 | ..... | 31 | ..... | 5,227 | 9,843 | 35,692 | ..... | 51,729 | 1,188 | 9 | ..... | 1,197 | ..... | 22 |
| 1923 | ..... | ..... | ..... | 74 | 1 | 494 | 346 | ..... | 34 | ..... | 5,402 | 10,867 | 39,147 | ..... | 56,365 | 1,054 | 9 | ..... | 1,063 | ..... | 24 |
| 1924 | ..... | ..... | ..... | 76 | 2 | 497 | 406 | ..... | 39 | ..... | 5,657 | 13,369 | 45,355 | ..... | 65,401 | 1,122 | 11 | ..... | 1,133 | ..... | 24 |
| 1925 | ..... | ..... | ..... | 158 | 3 | 459 | 541 | ..... | 61 | ..... | 5,960 | 16,650 | 52,448 | ..... | 76,280 | 1,226 | 12 | ..... | 1,238 | ..... | 23 |
| 1926 | ..... | ..... | ..... | 150 | 2 | 478 | 653 | ..... | 41 | ..... | 5,844 | 23,314 | 64,311 | ..... | 94,793 | 1,188 | 9 | ..... | 1,197 | ..... | 17 |
| 1927 | ..... | ..... | ..... | 112 | 2 | 504 | 663 | ..... | 47 | ..... | 5,342 | 26,368 | 77,018 | ..... | 110,056 | 1,267 | 8 | ..... | 1,275 | ..... | 13 |
| 1928 | ..... | ..... | ..... | 94 | 1 | 512 | 630 | ..... | 46 | ..... | 5,492 | 30,773 | [D]84,745 | ..... | 122,293 | 1,842 | 8 | ..... | 1,850 | ..... | 15 |
| 1929 | ..... | ..... | ..... | 93 | ..... | 535 | 704 | ..... | 45 | ..... | 4,988 | 34,758 | [D]99,507 | ..... | 140,630 | 1,868 | 20 | ..... | 1,888 | ..... | 33 |
| 1930 | ..... | ..... | ..... | 157 | [B] | 523 | 1,182 | ..... | 59 | ..... | 4,904 | 41,624 | [D]125,555 | ..... | 174,004 | 1,996 | 16 | ..... | 2,012 | ..... | 40 |
| 1931 | ..... | ..... | ..... | 134 | [E] | 520 | 1,606 | ..... | 124 | ..... | 4,662 | 49,127 | 162,842 | ..... | 219,015 | 2,038 | [E] | ..... | 2,038 | ..... | 54 |
| 1932 | ..... | ..... | ..... | 126 | [E] | 530 | 1,608 | ..... | 208 | ..... | 4,116 | 53,815 | 154,367 | ..... | 214,770 | 1,895 | [E] | 7 | 1,902 | ..... | 62 |
| 1933 | 11 | ..... | ..... | 122 | [E] | 562 | 1,665 | ..... | 204 | ..... | 4,072 | 54,020 | 154,840 | ..... | 215,496 | 1,663 | [E] | 7 | 1,670 | ..... | 71 |
| 1934 | 10 | ..... | ..... | 178 | [E] | 557 | 2,187 | ..... | 151 | ..... | 3,913 | 62,063 | 174,318 | ..... | 243,377 | 1,546 | [E] | 6 | 1,552 | ..... | 96 |
| 1935 | 41 | 44 | ..... | 133 | [E] | 541 | 2,996 | ..... | 119 | ..... | 3,812 | 61,310 | 182,386 | 2 | 251,384 | 1,301 | [E] | 4 | 1,305 | 5 | 4 |
| 1936 | 273 | 50 | ..... | 127 | [E] | 503 | 3,115 | ..... | 123 | ..... | 3,789 | 63,659 | 186,206 | 1 | 257,846 | 1,278 | [E] | 4 | 1,282 | 5 | 4 |
| 1937 | 619 | 221 | ..... | 123 | [E] | 502 | 3,176 | 16 | 110 | ..... | 3,716 | 52,452 | 193,241 | 4 | 254,180 | 1,196 | [E] | 22 | 1,218 | 4 | 4 |
| 1938 | 752 | 383 | ..... | 130 | [E] | 513 | 3,861 | 288 | 101 | ..... | 3,763 | 48,487 | 204,956 | 9 | 263,243 | 1,581 | [E] | 27 | 1,608 | 4 | 4 |
| 1939 | 934 | 1,240 | ..... | 120 | ..... | 500 | 4,487 | 1,103 | 91 | ..... | 3,898 | 45,648 | 216,866 | 10 | 274,897 | 4,666 | [E] | 27 | 4,693 | 3 | 4 |
| 1940 | 1,497 | 2,808 | ..... | 163 | 124 | 496 | 7,371 | 1,881 | 85 | ..... | 3,891 | 43,168 | 218,600 | 10 | 280,094 | 6,505 | [E] | 27 | 6,532 | 2 | 14 |
| 1941 | 1,334 | 4,238 | ..... | 183 | 223 | 414 | 6,303 | 3,183 | 95 | ..... | 1,793 | 40,517 | 238,150 | 10 | 296,443 | 8,546 | [E] | 27 | 8,573 | 3 | ..... |
| 1942 | 1,601 | 5,899 | ..... | 271 | 605 | 463 | 5,191 | 5,037 | 101 | ..... | 2,794 | 42,094 | 227,470 | 10 | 291,536 | 8,275 | [E] | 41 | 8,316 | 2 | ..... |
| 1943 | 1,001 | 7,478 | ..... | 200 | 839 | 356 | 4,973 | 6,347 | 86 | 1 | 3,500 | 39,182 | 200,750 | 10 | 264,723 | 8,953 | ..... | 39 | 8,992 | 2 | ..... |
| 1944 | 334 | 8,218 | ..... | 185 | 703 | 300 | 6,154 | 6,277 | 55 | 12 | 3,000 | 26,191 | 275,000 | 220 | 326,649 | 9,416 | 4 | 32 | 9,452 | 2 | ..... |
| 1945 | 267 | 3,074 | ..... | 91 | 532 | 202 | 3,935 | 5,018 | 53 | 41 | 750 | 34,772 | 148,953 | 200 | 197,888 | 9,406 | 2 | 26 | 9,434 | 3 | ..... |
| 1946 | 1,000 | 5,734 | ..... | 196 | 412 | 368 | 4,539 | 5,146 | 83 | 435 | 866 | 31,434 | 157,673 | 160 | 208,046 | 9,070 | 1 | 20 | 9,091 | 2 | ..... |
| 1947 | 2,000 | 6,285 | ..... | 210 | 351 | 356 | 4,032 | 4,330 | 81 | 1,478 | 951 | 28,552 | 187,463 | 290 | 236,379 | 8,627 | 1 | 21 | 8,649 | 2 | ..... |
| 1948 | 1,500 | 6,149 | ..... | 204 | 323 | 369 | 4,489 | 3,647 | 71 | 3,443 | 1,039 | 34,000 | 218,000 | 270 | 273,504 | 13,398 | 1 | 100 | 13,499 | 3 | ..... |
| 1949 | 2,188 | 6,100 | ..... | 292 | 338 | 411 | 5,947 | 3,791 | 71 | 4,314 | 1,125 | 33,700 | 237,700 | 470 | 296,447 | 15,997 | 2 | 136 | 16,135 | 8 | ..... |
| 1950 | 2,800 | 10,200 | ..... | 292 | 340 | 909 | 8,107 | 3,700 | 63 | 4,897 | 1,205 | 32,000 | 266,200 | 780 | 331,493 | 16,373 | 24 | 305 | 16,702 | 8 | ..... |
| 1951 | 1,200 | 15,500 | ..... | 644 | 335 | 2,036 | 9,681 | 3,500 | 135 | 4,942 | 1,502 | 31,000 | 285,000 | 1,067 | 356,542 | 16,311 | 49 | 587 | 16,947 | 7 | ..... |
| 1952 | 1,100 | 18,760 | ..... | 740 | 407 | 2,377 | 12,435 | 3,500 | 487 | 4,975 | 1,700 | 45,000 | 322,400 | 1,091 | 414,972 | 16,464 | 348 | 749 | 17,561 | 9 | ..... |
| 1953 | 1,400 | 21,860 | ..... | 900 | 410 | 2,555 | 15,505 | 5,000 | 656 | 5,701 | 1,800 | 67,000 | 363,000 | 1,236 | 487,023 | 16,501 | 641 | 761 | 17,903 | 8 | ..... |
| 1954 | 1,600 | 23,400 | 536 | 1,100 | 450 | 3,616 | 19,008 | 7,500 | 535 | 6,535 | 2,000 | 70,000 | 411,000 | 1,557 | 548,837 | 13,774 | 570 | 881 | 15,225 | 7 | ..... |
| 1955 | 1,500 | 24,880 | 1,000 | 1,000 | 408 | 6,224 | 22,436 | 11,000 | 1,519 | 7,137 | 1,500 | 78,900 | 517,500 | 2,027 | 676,931 | 12,634 | 435 | 765 | 13,834 | ..... | ..... |
| 1956* | 2,441 | 23,268 | 1,600 | 1,201 | 489 | 9,103 | 24,894 | 7,630 | 4,822 | 7,652 | 1,363 | 81,387 | 571,208 | 1,982 | [K]739,311 | 12,174 | 293 | 720 | [H]13,249 | 18 | ..... |
| 1957* | 3,268 | 21,623 | 1,800 | 673 | 614 | 10,647 | 28,113 | 5,110 | 8,555 | 10,640 | 1,350 | 81,900 | 802,000 | 2,665 | [M]978,990 | 16,476 | 187 | 566 | [§]18,604 | 5 | ..... |
| Total | 30,671 | 217,412 | 4,936 | 10,983 | 7,923 | 51,870 | 238,926 | 93,004 | 20,263 | 62,203 | 291,033 | 1,712,673 | 9,834,856 | 14,081 | 12,591,137 [N] | 257,209 | 2,701 | 5,907 | 267,254 | 113 | 1,044 |

[B] Less than 1,000 barrels. [C] Estimated production. [D] Year ended September 30. [E] No more data. [F] Includes fields in Russian Asia, other than Sakhalin.
[G] France's earlier production credited to Germany. [H] Includes 62,000 barrels from Angola. * WORLD OIL from private sources. [I] Includes Sicily. [§] Includes 1,282,000 from French Equatorial Africa, and 9,000 barrels from Liberia and 84,000 barrels from Angola. [K] Includes 271,000 barrels from E. Germany.
[M] Includes 32,000 barrels from E. Germany. [N] Includes 303,000 barrels from E. Germany.




# World Oil Demand . . . sets a new record; 24.8 million bpd foreseen for 1967.

WORLD SUPPLIES of crude oil, natural gasoline and lease condensates increased to 18,678,300 barrels daily in 1957, creating an excess over demand of 471,300 barrels per day. The 1957 excess is more than double that of 1956, when supply outpaced demand 224,100 barrels daily.

The oversupply total increased despite a record petroleum demand of 18,207,000 barrels per day last year, an increase of 683,000 barrels daily or 3.8 percent over the world demand total of 17,524,000 barrels daily during 1956. However, the gain in demand was much smaller than the 1956 increase of 1,311,000 barrels per day, or 8.1 percent over the totals recorded for 1955.

Reasons for the changing world demand-supply picture: Middle East production, geared to supply U. S. markets and growing European demand, lost those major markets during the Suez crisis; U. S. and Venezuelan production, stepped up to record levels to supply Europe during the crisis, created a serious over-supply problem when the blockade was lifted; rationing of European oil users during the crisis lowered that continent's demand total for the year; spiraling post war U. S. demand growth began tapering off last year.

As a result, storage facilities were heavily burdened and the excess supply tended to have a depressing effect on prices. There is an estimated 4.5 million barrels of daily worldwide crude oil producing capacity currently shut in. And the increased recent tempo of concessions activity, particularly in the Middle East until the Iraq upheaval, has threatened to further aggravate the oversupply problem.

**Supply-Demand outside the U.S.** Within two years, the supply-demand picture outside the U. S. has changed from excess demand to excess supply. In 1956, total demand averaged 8,745,000 barrels per day, an increase of 992,000 barrels daily over 1955. Total supply averaged 9,793,000 barrels daily in 1956, a daily increase of 964,000 barrels over 1955. Result: Demand outpaced supply by 27,500 barrels per day during the 1955-56 period.

On the other hand, supply exceeded demand outside the U. S. by 239,300 barrels per day during 1956-57. Total demand averaged 9,410,000 barrels daily last year, a daily increase of 665,000 barrels over 1956—considerably less than the 1955-56 increase.

The sharp drop in demand growth last year created the reversed supply-demand ratio during the 1955-57 period. Reason: Although total supply rose to a new high of 10,697,300 barrels per day outside the U. S. last year, the increase of 904,300 barrels daily over 1956 was 60,200 barrels per day less than the 964,500 barrels per day increase in 1956 over 1955.

**How Suez-affected areas fared.** Following is a report on the two areas that contributed most to the fluctuating demand-supply picture during 1955-57:

Free Europe: In 1957 total supply increased 43,200 barrels per day over the 1956 total of 544,700 barrels daily, compared with a smaller increase of 11,000 barrels per day in 1956 over the 1955 total.

Demand in Free Europe totaled 3,117,800 barrels per day last year, an increase of 103,500 barrels per day over 1956. This compares with the substantially larger demand increase of 469,600 barrels daily in 1956 over 1955.

Middle East: In 1957 total supply increased 89,900 barrels per day over the 1956 total of 3,450,500 barrels daily, compared with a substantially larger supply increase of 204,000 barrels per day in 1956 over the 1955 total.

Demand totaled 398,400 barrels per day last year, an increase of 14,800 barrels per day over 1956. This compares with the larger demand increase of 36,700 barrels daily in 1956 over

1955. Excess of supply over demand increased from 2,899,000 barrels per day in 1955 to 3,066,500 barrels per day in 1956. The excess supply last year increased to 3,142,000 barrels daily.

**Post war expansion slows down.** The World Economic Survey, released by the United Nations, says the general economic expansion following the Korean conflict lost most of its momentum last year. All industrial countries foresee a further slackening in economic activity during 1958, if not actual declines in output.

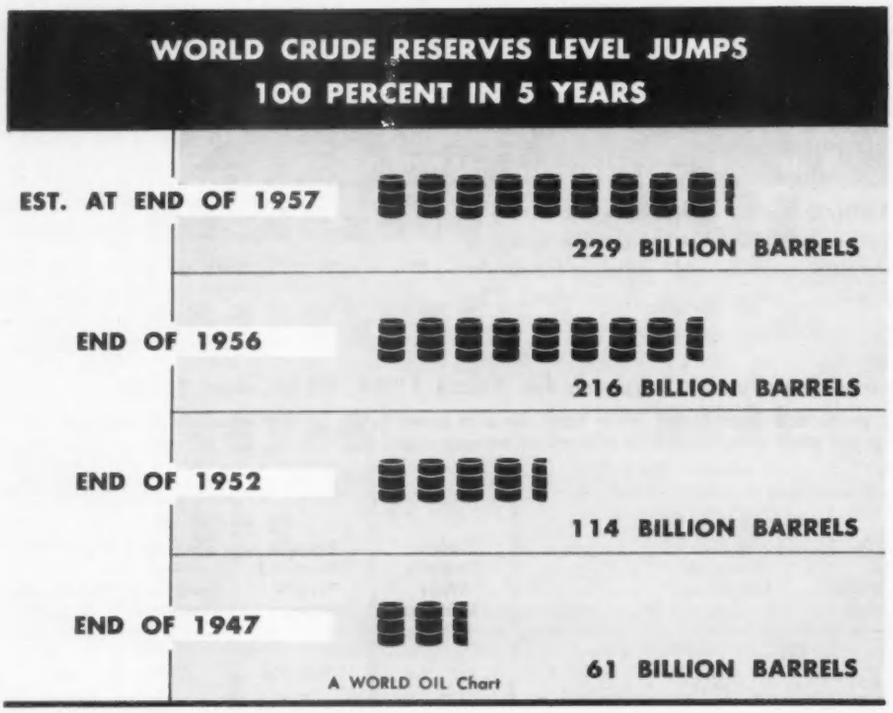
**Future looks brighter.** Despite the rather bleek short-term demand-supply picture, considerable comfort should be derived from the long-term view. The U. S. is expected to be consuming 12.1 million barrels of oil per day by 1967, largely because of increased gasoline needs of an expanded and more mobile population. In the Free World outside the U. S., use of 12.7 million barrels of oil daily is expected by 1967, for a total of 24.8 million barrels daily exclusive of Iron Curtain countries.

## World Petroleum Demand and Supply, by Regions, for Years 1957, 1956, and 1952

Source: All data from private sources. Crude oil production figures may differ from those in other tables in this issue, which are from U. S. Bureau of Mines and other sources, but such differences are inconsequential.

BARRELS PER DAY

| REGION | Domestic Demand | DOMESTIC SUPPLY | | | Excess Supply Over Demand | Excess Demand Over Supply | Percent of World | |
|---|---|---|---|---|---|---|---|---|
| | | Crude Oil | Natural Gasoline, Etc. | Total | | | Domestic Demand | Domestic Supply |
| **1957** | | | | | | | | |
| North America | 9,804,400 | 7,916,300 | 822,100 | 8,738,400 | ..... | 1,066,000 | 53.9 | 46.8 |
| United States | 8,797,000 | 7,175,000 | 806,000 | 7,981,000 | ..... | 816,000 | 48.3 | 42.7 |
| Canada | 738,500 | 498,200 | 9,400 | 507,600 | ..... | 230,900 | 4.1 | 2.7 |
| Other North America | 268,900 | 243,100 | 6,700 | 249,800 | ..... | 19,100 | 1.5 | 1.4 |
| South America | 1,183,600 | 3,202,800 | 21,400 | 3,224,200 | 2,040,600 | ..... | 6.5 | 17.3 |
| Venezuela | 171,600 | 2,780,600 | 7,100 | 2,787,700 | 2,616,100 | ..... | 0.9 | 14.9 |
| Other Caribbean Area | 209,900 | 217,800 | 6,700 | 224,500 | 14,600 | ..... | 1.2 | 1.2 |
| Other South America | 802,100 | 204,400 | 7,600 | 212,000 | ..... | 590,100 | 4.4 | 1.2 |
| Europe Excl. U.S.S.R. | 3,117,800 | 490,500 | 97,400 | 587,900 | ..... | 2,529,900 | 17.1 | 3.1 |
| U.S.S.R. | 1,952,000 | 1,966,000 | 54,000 | 2,020,000 | 68,000 | ..... | 10.7 | 10.8 |
| Africa | 460,200 | 49,600 | 5,500 | 55,100 | ..... | 405,100 | 2.5 | 0.3 |
| Middle East | 398,400 | 3,540,400 | ..... | 3,540,400 | 3,142,000 | ..... | 2.2 | 19.0 |
| Far East, Oceania | 1,290,600 | 507,300 | 5,000 | 512,300 | ..... | 778,300 | 7.1 | 2.7 |
| Total World | 18,207,000 | 17,672,900 | 1,005,400 | 18,678,300 | 471,300 | ..... | 100.0 | 100.0 |
| **1956** | | | | | | | | |
| North America | 9,754,500 | 7,869,300 | 823,400 | 8,692,700 | ..... | 1,061,800 | 55.7 | 49.0 |
| United States | 8,779,000 | 7,151,000 | 801,000 | 7,952,000 | ..... | 827,000 | 50.1 | 44.8 |
| Canada | 719,400 | 469,900 | 11,600 | 481,500 | ..... | 237,900 | 4.1 | 2.7 |
| Other North America | 256,100 | 248,400 | 10,800 | 259,200 | 3,100 | ..... | 1.5 | 1.5 |
| South America | 1,107,800 | 2,831,600 | 20,000 | 2,851,600 | 1,743,800 | ..... | 6.3 | 16.1 |
| Venezuela | 150,400 | 2,457,900 | 6,600 | 2,464,500 | 2,314,100 | ..... | 0.9 | 13.9 |
| Other Caribbean Area | 194,600 | 198,700 | 5,500 | 204,200 | 9,600 | ..... | 1.1 | 1.2 |
| Other South America | 762,800 | 175,000 | 7,900 | 182,900 | ..... | 579,900 | 4.3 | 1.0 |
| Europe Excl. U.S.S.R. | 3,014,300 | 453,700 | 91,000 | 544,700 | ..... | 2,469,600 | 17.2 | 3.1 |
| U.S.S.R. | 1,704,000 | 1,680,000 | 52,000 | 1,732,000 | 28,000 | ..... | 9.7 | 9.8 |
| Africa | 437,100 | 35,400 | 5,000 | 40 000 | ..... | 396,700 | 2.5 | 0.2 |
| Middle East | 383,600 | 3,450,500 | ..... | 3,450,500 | 3,066,900 | ..... | 2.2 | 19.4 |
| Far East, Oceania | 1,122,700 | 428,100 | 5,000 | 433,100 | ..... | 689,600 | 6.4 | 2.4 |
| Total World | 17,524,000 | 16,748,600 | 996,400 | 17,745,000 | 221,000 | ..... | 100.0 | 100.0 |
| **1952** | | | | | | | | |
| North America | 7,924,300 | 6,634,200 | 619,000 | 7,253,200 | ..... | 691,100 | 62.2 | 55.6 |
| Unites States | 7,280,000 | 6,256,400 | 612,000 | 6,868,400 | ..... | 411,600 | 57.0 | 52.6 |
| Other North America | 644,300 | 377,800 | 7,000 | 384,800 | ..... | 279,500 | 5.2 | 3.0 |
| South America | 820,200 | 2,095,300 | 16,800 | 2,112,100 | 1,291,900 | ..... | 6.4 | 16.2 |
| Caribbean Area | 275,100 | 1,968,600 | 10,800 | 1,979,400 | 1,704,300 | ..... | 2.1 | 15.2 |
| Other South America | 545,100 | 126,700 | 6,000 | 132,700 | ..... | 412,400 | 4.3 | 1.0 |
| Europe, Excl. U.S.S.R. | 1,794,000 | 220,300 | 67,100 | 287,400 | ..... | 1,506,600 | 14.1 | 2.2 |
| U.S.S.R. | 948,000 | 935,000 | 28,000 | 963,000 | 15,000 | ..... | 7.4 | 7.4 |
| Africa | 345,400 | 47,800 | 2,000 | 49,800 | ..... | 295,600 | 2.7 | 0.4 |
| Middle East | 241,000 | 2,083,900 | ..... | 2,083,900 | 1,842,900 | ..... | 1.9 | 15.9 |
| Far East, Oceania | 673,000 | 298,900 | 5,000 | 303,900 | ..... | 369,700 | 5.3 | 2.3 |
| Total World | 12,766,500 | 12,315,400 | 737,900 | 13,053,300 | 286,800 | ..... | 100.0 | 100.0 |




# World crude reserves . . . Total

## rises 5.9 percent in '57 to new high of 229.2 billion barrels.

FREE WORLD crude oil reserves rose to a new high of 229,199,744,000 barrels on Jan. 1, 1958—an increase of 12.7 billion barrels, or 5.9 percent, over the revised estimates of the total at the beginning of 1957. Normal development of major Middle East oil fields accounted for most of the increase.

In contrast to the world picture, total reserves decreased in the U. S. last year for the first time since 1943. During 1957 reserves dropped 134.2 million barrels, or .04 percent, leaving an 11.5-year supply on hand based on 1957 production rates.

**Middle East Leads.** Following a well established pattern in recent years, the Middle East acounted for 8.2 billion barrels or nearly two-thirds of the Free World's increase in reserves during 1957. The area's total reserves rose to 164.3 billion barrels for 71.7 percent of the world total. In 1946 the Middle East accounted for only 40.7 percent of the world's crude supply.

Seven billion barrels of the Middle East's reserve increase last year were proved up in Kuwait and Saudi Arabia. Kuwait increased its reserves 4 billion barrels; Saudi Arabia's increased 3 billion.

Kuwait still leads all other nations with 58 billion barrels of reserves. Steady development drilling in Burgan, Magwa and Ahmadi has shown these fields to represent a large continuous productive area and the world's largest crude deposit. Additional boosts in reserves may be expected when Raudhatain field in northern Kuwait has been fully developed. A probable field reserve of more than 5 billion barrels had been indicated by wells completed at Raudhatain by mid-1958.

Nine new oil wells were completed in Saudi Arabia's Safaniya field during 1957, helping to boost the nation's reserve estimates to 45 billion barrels. Additional increases may be expected as the new Khurais and Manifa fields, found in 1957, are developed. Khurais already had been extended four miles as of mid-year 1958.

Saudi Arabia is expected to pass Kuwait in total reserves eventually, due to greater area for exploration and development. But tiny Kuwait very likely will remain the world's top oil reserve for many years.

The Neutral Zone also has increased reserves sharply in recent years because of vigorous drilling activity in the Wafra field. Official American Independent Oil Company reserve figures for Wafra at the start of the year was 633 million barrels. Other companies familiar with the area contend that this figure is very conservative. It is likely that Wafra field has more than a billion barrels in recoverable reserves.

**North America.** As U. S. reserves decreased from 30,434,649,000 barrels to 30,300,405,000 barrels during 1957, Canada's increased slightly from 2,849,370,000 barrels to 2,874,454,000 barrels. Reserves estimates for these two areas were expected to improve during the last half of 1958, as improved economic conditions lead to more vigorous drilling activity.

Alaska reserves at Umiat field have been adjusted upward to 57 million barrels, an estimate announced last year by DeGolyer and MacNaughton of Dallas. Completion in 1957 of Richfield Oil Corporation's Swanson River Unit 1 on the Kenai Peninsula would appear good for at least 500,000 barrels, with increases expected in the future as the field is extended.

**South America.** In Venezuela, a record number of well completions including a number of promising wildcat discoveries and field extensions, increased the country's reserves 1.3 billion barrels to a total of 15.3 billion during 1957. The substantial reserve increase was proved up despite record production that exceeded a billion barrels for the first time. The new "golden lane" of discoveries in Lake Maracaibo in the new concessions area indicate additional increases in future Venezuelan reserve estimates.

Estimates of Brazil's reserve have been raised 121.5 million barrels to 821.5 million due to increased activity and successful completions in the Bahia fields during the past several years. Production has been increased at a rapid rate also.

**Western Europe.** Last year, Western Europe increased its total reserves only slightly, from 1,222,500,000 barrels to 1,249,500,000 barrels—a 15.6 year supply at 1957 production rates.

Germany's reserves have been raised gradually to 379 million barrels as of last January 1. Revisions of previous estimates for The Netherlands, and recent oil discoveries in Western Holland, have caused the area's reserve total to be increased to 200 mil-

lion barrels from the 150 million barrel estimate made at the start of 1957.

**Africa.** Reserve estimates for Africa more than doubled between Jan. 1, 1957, and the beginning of 1958, increasing from 558.3 million barrels to 1.7 billion. This was by far the largest percentage increase among all the major oil producing areas.

In Algeria, not enough wells had been completed in Hassi-Messaoud field as of Jan. 1, 1957, to justify placing the apparent reserves into the proved category. However, by January 1 of this year, five producing wells, though spaced about four miles apart, must be considered to have proved a continuous area in between, containing over 800 million barrels.

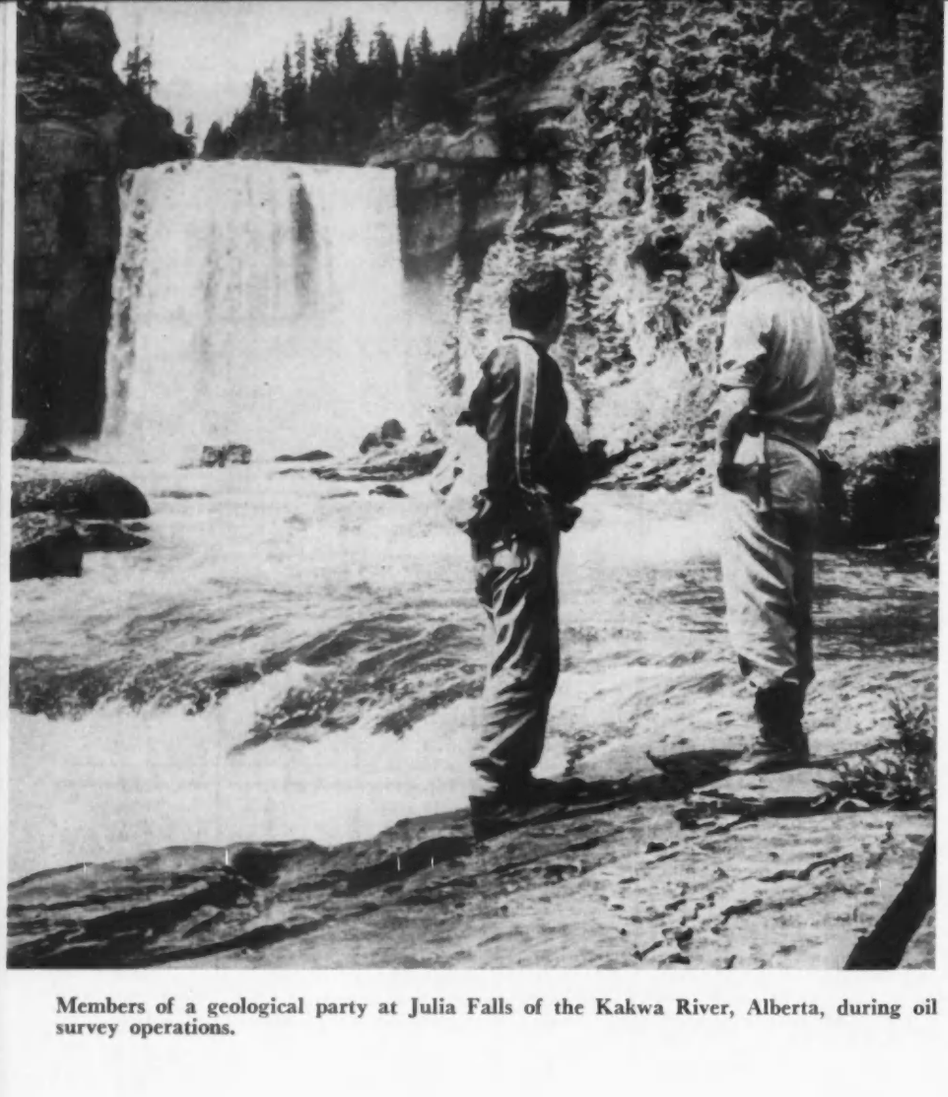
**Far East.** In Indonesia, the Minas field continued to surpass previous reserve estimates. Increased from 4 to 6 billion barrels in 1956, last year the area's total was again revised upward to 7.5 billion barrels. The estimated 1.5 billion-barrel increase for the Minas field represented virtually all of the Far East's reserve increase during 1957.

## Free World Proved Crude Oil Reserves

Reserves estimated by WORLD OIL with the aid of oil companies and other sources.
(THOUSANDS OF BARRELS)

| CONTINENT AND COUNTRY | RESERVES | | Percent of World in 1958 | ANNUAL PRODUCTION IN 1957 | | Ratio of 1958 Reserves to 1957 Production |
|---|---|---|---|---|---|---|
| | Jan. 1, 1957 (Revised) | Jan. 1, 1958 | | Thousands of Barrels | Percent of Free World | |
| **North America** | **35,094,019** | **35,301,419** | **15.4** | **2,892,927** | **51.5** | **12.2** |
| Alaska | 57,000 | 58,000 | .... | ..... | .... | ..... |
| Canada | 2,849,370 | 2,874,454 | 1.3 | 181,813 | 3.2 | 15.8 |
| Cuba | 3,000 | 2,800 | .... | 395 | .... | 7.1 |
| Mexico | 1,750,000* | 2,065,760* | 0.9 | 92,197* | 1.6 | 22.4 |
| United States | 30,434,649 | 30,300,405 | 13.2 | 2,618,522 | 46.7 | 11.5 |
| **South America** | **16,642,000** | **18,232,500** | **8.0** | **1,168,511** | **20.8** | **15.6** |
| Argentina | 450,000 | 500,000 | 0.2 | 33,855 | 0.6 | 14.8 |
| Bolivia | 75,000 | 75,000 | .... | 3,575 | 0.1 | 21.0 |
| Brazil | 700,000 | 821,500 | 0.4 | 10,106 | 0.2 | 81.3 |
| Chile | 50,000 | 50,000 | .... | 4,337 | 0.1 | 11.5 |
| Colombia | 650,000 | 700,000 | 0.3 | 45,738 | 0.8 | 15.3 |
| Ecuador | 27,000 | 25,000 | .... | 3,191 | 0.1 | 7.8 |
| Peru | 400,000 | 414,000 | 0.2 | 19,222 | 0.3 | 21.5 |
| Trinidad | 290,000 | 300,000 | 0.2 | 34,063 | 0.6 | 8.8 |
| Venezuela | 14,000,000 | 15,347,000 | 6.7 | 1,014,424 | 18.0 | 15.1 |
| **Europe, Western** | **1,222,500** | **1,249,500** | **0.6** | **80,182** | **1.4** | **15.6** |
| Austria | 385,000 | 340,000 | 0.1 | 21,623 | 0.4 | 15.7 |
| France | 150,000 | 150,000 | 0.1 | 10,647 | 0.2 | 14.1 |
| Germany, West | 367,000 | 379,000 | 0.2 | 28,113 | 0.5 | 13.5 |
| Great Britain | 5,500 | 5,500 | .... | 614 | .... | 9.0 |
| Italy and Sicily | 165,000 | 175,000 | 0.1 | 8,555 | 0.1 | 20.5 |
| Netherlands | 150,000 | 200,000 | 0.1 | 10,640 | 0.2 | 18.8 |
| **Africa** | **558,300** | **1,701,700** | **0.7** | **18,604** | **0.3** | **91.5** |
| Algeria | 25,000 | 1,000,000 | 0.4 | 187 | .... | 5,347.6 |
| Egypt (Incl. Sinai) | 500,000 | 600,000 | 0.3 | 16,476 | 0.3 | 36.4 |
| Morocco | 7,000 | 6,700 | .... | 566 | .... | 11.8 |
| Angola | 5,000 | 15,000 | .... | 84 | .... | 178.6 |
| French Equatorial Africa | 20,000 | 60,000 | .... | 1,282 | .... | 46.8 |
| Nigeria | 1,300 | 20,000 | .... | 9 | .... | 2,222.2 |
| **Asia, Total** | **162,972,650** | **172,714,125** | **75.3** | **1,460,555** | **26.0** | **118.3** |
| **Asia, Middle East** | **156,057,000** | **164,312,000** | **71.7** | **1,291,657** | **23.0** | **127.2** |
| Bahrain | 160,000 | 152,000 | 0.1 | 11,691 | 0.2 | 13.0 |
| Iran | 32,000,000 | 32,000,000 | 14.0 | 261,340 | 4.7 | 122.4 |
| Iraq | 22,000,000 | 22,000,000 | 9.6 | 163,498 | 2.9 | 134.6 |
| Israel | 8,000 | 10,000 | .... | 400 | .... | 25.0 |
| Kuwait | 54,000,000 | 58,000,000 | 25.3 | 416,000 | 7.4 | 139.4 |
| Neutral Zone | 4,300,000 | 5,400,000 | 2.4 | 23,200 | 0.4 | 232.8 |
| Qatar | 1,500,000 | 1,650,000 | 0.7 | 51,356 | 0.9 | 32.1 |
| Saudi Arabia | 42,000,000 | 45,000,000 | 19.6 | 362,121 | 6.5 | 124.3 |
| Syria | 4,000 | 10,000 | .... | ..... | .... | ..... |
| Turkey | 85,000 | 90,000 | .... | 2,051 | .... | 43.9 |
| **Asia, Far East** | **6,915,650,650** | **8,402,125** | **3.6** | **168,898** | **3.0** | **49.7** |
| Burma | 43,500 | 43,500 | .... | 2,610 | 0.1 | 16.7 |
| India | 300,000 | 300,000 | 0.1 | 3,407 | 0.1 | 88.1 |
| Indonesia | 6,000,000 | 7,500,000 | 3.3 | 114,305 | 2.0 | 65.6 |
| Japan | 22,000 | 21,500 | .... | 2,243 | .... | 9.6 |
| New Guinea | 20,000 | 18,000 | .... | 2,294 | .... | 7.8 |
| Sarawak-Brunei (Br. Borneo) | 510,000 | 500,000 | 0.2 | 42,038 | 0.8 | 11.9 |
| Taiwan (Formosa) | 150 | 125 | .... | 17 | .... | 7.4 |
| Pakistan | 20,000 | 19,000 | .... | 1,984 | .... | 9.6 |
| **Australia-New Zealand** | **500** | **500** | .... | **5** | .... | **100.0** |
| **Total Free World** | **216,489,969** | **229,199,744** | **100.0** | **5,620,794** | **100.0** | **40.7** |

* Including crude oil and distillate.



**Members of a geological party at Julia Falls of the Kakwa River, Alberta, during oil survey operations.**

# Canada . . . Problems of growth follow another record-breaking production year in 1957.

CANADA, in 1957, set crude oil and natural gas producing records while establishing all-time reserves for both. Crude output amounted to 181,813,195 barrels for a daily average of almost 500,000 barrels. At the close of the year, 12,089 wells were in production.

Record oil output during the year resulted from the Suez crisis. Natural gas began moving toward export markets during the last half of 1957; however, the industry remained bound by uncertainties, including the need for wider authority before existing pipe line systems—east or west—can reach their full operating levels.

**Drilling.** Like crude oil production, drilling activity reached record proportions during the first half of the year, but they were curtailed as produceability outstripped markets. Reduced last half operations resulted in a lower full year completion rate than that of 1956. In 1957, completions amounted to 3,000 wells, 9.4 percent lower than in 1956.

Problems that beset western Canada's oil and gas industry, for a decade the fastest growing natural resource industry in the nation, were not expected to be resolved easily. But it was hoped that Dominion Government action would help ease the problems. Action already taken includes the appointment of the Borden Royal Commission by Prime Minister John D. Diefenbaker. The group will study and submit recommendations on:

- National policies relating to the export of energy and sources of energy from Canada.
- Policies relating to regulation of transmission of oil and natural gas between provinces or from Canada to another country.
- Extent of authority that might be conferred on a national energy board.
- Whether, in view of its special relationship to the Northern Ontario Pipeline Crown Corporation and the nature of its financing and control, any special measures need be taken in relation to Trans-Canada Pipe Lines Limited to safeguard interests of Canadian producers or consumers.

Reassurance that the commission realized the importance of a healthy oil industry to the Canadian economy may have been indicated by the fact that oil and gas were selected as the starting points in the study of energy resources.

**Reserves at new high.** Canadian Petroleum Association Reserves committee reported that as of the end of 1957 Western Canada's remaining proved crude reserves amounted to 2,870,599,000 barrels of crude oil and 394,660,000 barrels of natural gas liquids. New reserves discovered in 1957 amounted to 266,926,000 barrels. These reserves were added by the drilling of 1,058 exploratory wells. Therefore, the discovery rate last year may be put at about 252,000 barrels per wildcat.

Natural gas reserves of western Canada at year's end were estimated by the association at 20,549,776 MMcf. During the year, extensions and revisions to previously-discovered fields added 1,167,050 Mcf, and the discoveries of new fields and new pools in old fields accounted for the 795,490 MMcf addition to reserves.

**Drilling.** During the first six months of 1958, western Canada drilling activity accounted for 1,113 wells, resulting in the completion of 645 oil wells, 88 gas producers and 380 abandonments. This report reflected a downward trend in drilling activity from the previous year, when 1,452 first-half-of-the-year completions resulted in 973 oil producers, 67 gas wells and 410 dry holes.

## BRITISH COLUMBIA

British Columbia stepped into the role of a major gas producing area during 1957, and, by the end of the year, northeastern British Columbia gas fields were linked directly with consumers in the lower mainland of B. C. as well as with other pipe line facilities in the Northwest U.S. area.

Gas production by year-end totaled more than 9 billion cubic feet, and market build-up has proved to be much larger than initially anticipated in the Vancouver and adjacent areas. Gas deliveries from the producing areas rocketed during the first quarter of 1958. Latest available data showed production of 16,653,634 Mcf for the period from January to March 31, 1958, with an output of 5,707,534 Mcf in March alone.

Westcoast Transmission Company has plans for increasing facilities of its B.C.—Vancouver delivery system, contingent upon the approval of additional gas export to the United States.

**Production.** Oil production in this province also made major advances during the year and was continuing to increase in 1958. Production in 1957 totalled 340,945 barrels, about 934 barrels daily. In March of this year, a record production rate of 1,746 barrels daily was set. The province has the potential to produce over 2,500 barrels daily, and development of its more important oil discoveries could double or triple that potential this year.

Facilities for marketing the area's future crude production were under consideration. One proposal was to deliver the crude to seaboard by pipe line with Kitimat proposed as the western terminus of a big-inch line that could move 200,000 barrels daily.

**Drilling.** Drilling activity in British Columbia showed nearly 100 percent increase in 1957 when compared to 1956. The 94 completions in 1957 included 8 oil, 43 gas and 43 dry holes, while in 1956 there were 57 well completions, 7 oil, 34 gas and 16 dry holes. The search for oil and natural gas by geophysical methods reached a peak in 1957, and seismic operators worked 148 crew months, slightly better than 10 percent of total western Canada activity.

Petroleum and natural gas rights underlying the whole of the northeastern sector exploration area originally were vested in the Crown and, as of April 30, more than 30 million acres of rights were held by oil exploration and development companies in various forms of lease and reservation permits. A recent land play has developed in the Queen Charlotte Islands off the West Coast mainland and preliminary exploration of these rights was expected late in 1958 and early 1959. Richfield Oil Corporation, Los Angeles, was preparing extensive testing in that area.

The British Columbia discovery picture for 1957 shows significant oil discoveries in the Blueberry River and Milligan areas, important extensions to the Boundary Lake oil field and encouraging oil finds in the Buick Creek, Fort St. John and Stoddard areas. New gas finds were recorded in the Buick Creek, Dawson Creek, Fort St. John and Halfway Lake areas.

In the Blueberry River region, about 55 miles northwest of Fort St. John, the team of White-Lloyd and Associates, Fargo Oils Limited and Gulf States Oil Company chalked up a discovery in the Mississippian formation. This zone just below 7,000 feet previously was found productive of gas.

The Milligan Creek Oil discovery made by Hudson's Bay Oil & Gas and Union Oil Company in the early part of 1957 was not followed up until early in 1958, but stepout drilling proved the area could be a potentially large oil reserve. This producing region is 65 miles north-northeast of Fort St. John and 55 miles north-northwest of Boundary Lake producing area.

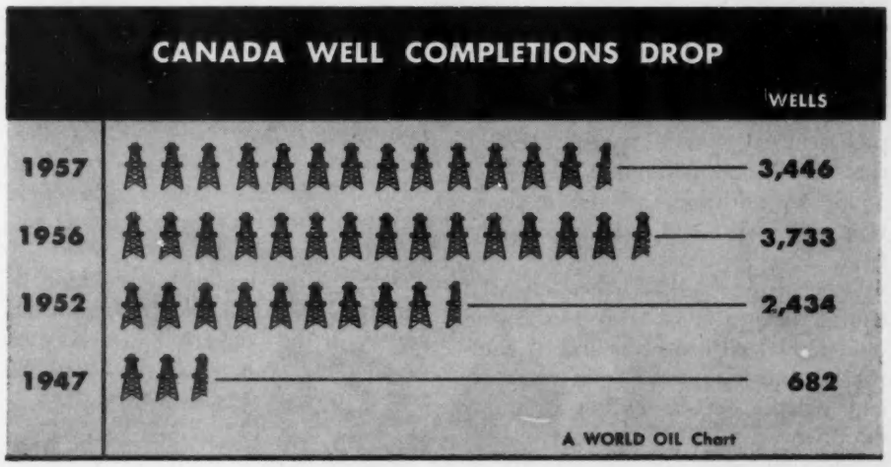
In the first four months of 1958, no oil discoveries were recorded but five new gas strikes were made.

## ALBERTA

After having enjoyed a sizable production rate increase in 1957, Alberta production cutbacks became necessary. By year's end, the almost 8,000 wells capable of production were producing less than 300,000 barrels daily —less than 40 percent of their potential of more than 750,000 barrels a day.

As 1958 progressed, this production rate slipped to the lowest point of the past three years and, in May, reached a level of 266,505 barrels per day. That was only slightly above the economic allowable for the province's wells.

**Natural gas.** Natural gas producers fared better than ever during the year. But even with volume deliveries underway to the Trans-Canada pipe lines project, only a small percentage of the gas wells drilled in the provinces were on production.




At year's end, it was estimated that $150 million remained tied up in non-revenue producing capital at capped western Canada gas wells which were without access to markets. Costly carrying charges were building up against the potential producers as well as the additional burden of lease rentals and maintenance costs. In Alberta, more than 750 gas wells were without a market.

Production from the few wells in the Bindloss and Provost fields tied into the export system, as well as domestic supply wells and a few supplying limited production to Montana, added up to a record 244,224,735 Mcf. Daily average production rate in December was 825,048 Mcf. Gas exports in December amounted

## 1958 Production and Drilling in Canada

| | Alberta | Sask. | Man. | B.C. | N.W.T. | Ontario | Quebec | New B. | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1. Proved crude reserves as of Jan. 1, 1958 (Thous. of barrels) | 2,360,933 | 420,457 | 34,258 | 2,093 | 52,858 | 3,763 | Nil | 92 | 2,874,454 |
| Gas reserves: Millions of cubic feet | 17,702,885 | 1,011,118 | 2,993 | 1,803,075 | 29,705 | 190,287 | 983 | 1,085 | 20,742,131 |
| 2. Crude Production during 1957 (Bbls) | 137,492,316 | 36,861,089 | 6,089,743 | 340,945 | 382,701 | 627,000 | Nil | 19,401 | 181,813,195 |
| 3. Producing crude oil wells at end of 1957** | 7,136 (8015) | 2,652 (3231) | 734 (848) | 20 | 62 | 1,468 | ..... | 17 | 12,089 (Actual Prod'g.) |
| 4. Number of wells completed during 1957: | | | | | | | | | |
| Oil | 874 | 853 | 117 | 8 | ..... | 46 | ..... | ..... | 1,898 |
| Gas | 135 | 16 | ..... | 43 | ..... | 162 | ..... | 1 | 357 |
| Dry* | 441 | 358 | 108 | 43 | 4 | 213 | 23 | 1 | 1,191 |
| TOTAL | 1,450 | 1,227 | 225 | 94 | 4 | 421 | 23 | 2 | 3,446 |
| 5. Footage drilled during 1957 | 7,623,393 | 5,327,522 | 516,415 | 530,248 | 11,165 | 507,726 | 64,325 | 7,088 | 14,587,882 |
| 6. Number of refineries in | 10 | 9 | 4 | 5 | 1 | 6 | 5 | 1 | 41 |
| Total daily crude charging capacity | 80,057 | 71,000 | 35,000 | 76,000 | 1300 | 215,500 | 262,800 | 300 | 741,957 |
| 1957 daily average crude runs to stills | 68,161 | 53,140 | 27,000 | 60,799 | 1070 | 158,900 | 242,200 | 100 | 611,370 |

* Includes service wells.
** Bracketed figures: No. of wells **capable** of producing.

to 4,513,460 Mcf and 22,503,907 Mcf for the year.

**Drilling decline.** Alberta's 1957 drilling operations resulted in 1,450 completions—a drop from the 1955 and 1956 levels. Results for the year showed 874 oil wells, 135 gas wells and 441 dry holes. Last year's completion total was 22 percent below the 1,856 completions recorded in 1956. In addition, seismic exploration suffered a 10 percent decline from 1956.

Alberta recorded 88 discovery well completions in 1957, with 51 showing commercial oil prospects and 37 finding natural gas in apparent commercial volume. While almost as many oil discoveries were reported in 1957 as in 1956, gas discovery decreased by 25 percent.

Most major oil strikes last year occurred in Virginia Hills, Swan Hills, Kaybob, Innisfail area, and Bellshill Lake area, where important Basal quartz and Viking oil discoveries were made.

Gas discoveries that likely will prove significant were made in the Castle River and Waterton Park areas just north of the Montana border; the Whitecourt region, in the central west part of Alberta; and Lambert Creek, in the Foothills Belt almost due west of Edmonton and just east of the British Columbia border.

Significance of the Virginia Hills, Swan Hills and Kaybob discoveries lies in the proving that the Beaverhill Lake section of Middle Devonian age is a potentially large source of reserves in Western Canada. Until the discovery in this section, made at Home Oil Co., Ltd.—Hudson's Bay Oil and Gas Co., Ltd.'s Virginia Hills 9-20 in February, no significant volume of oil had been recovered from this zone. Previously, drillstem tests at other wells in the region had yielded minor shows.

When Virginia Hills 9-20 flowed 40 gravity oil to surface on drillstem test and when, a month later, the Home et al Swan Hills 8-11-68-10w5 located 25 miles northeast flowed oil from the same section, another field comparable to Pembina was envisioned by some.

Still further impetus was added by Phillips Petroleum Company's oil discovery in the Beaverhill in a Kaybob area wildcat, Kaybob 1, about 30 miles to the west-southwest.

**Kaybob.** The Kaybob area, the western Beaverhill Lake zone oil discovery, has been active as its discoverers, Phillips Petroleum Company, Standard Oil Company of California and British-American Oil Company, drilled six successful oil wells, and four more wells were under way early in May, 1958. More development locations had been staked.

This area set a western Canada record for pipe line connection, for, with only two wells on production, a spur was constructed from the Peace River oil pipe line to field tank batteries. Oil from the field is marketed through tie-ins with that system and the Trans Mountain oil pipe line.

**Innisfail.** Canadian Oil Companies Limited's Innisfail discovery is of particular importance since it is the most southwesterly productive Devonian D3 zone yet recorded. Its geographic location, near main highways and populated centers only 60 miles north of Calgary, and the diversified land holdings have led to rapid development.

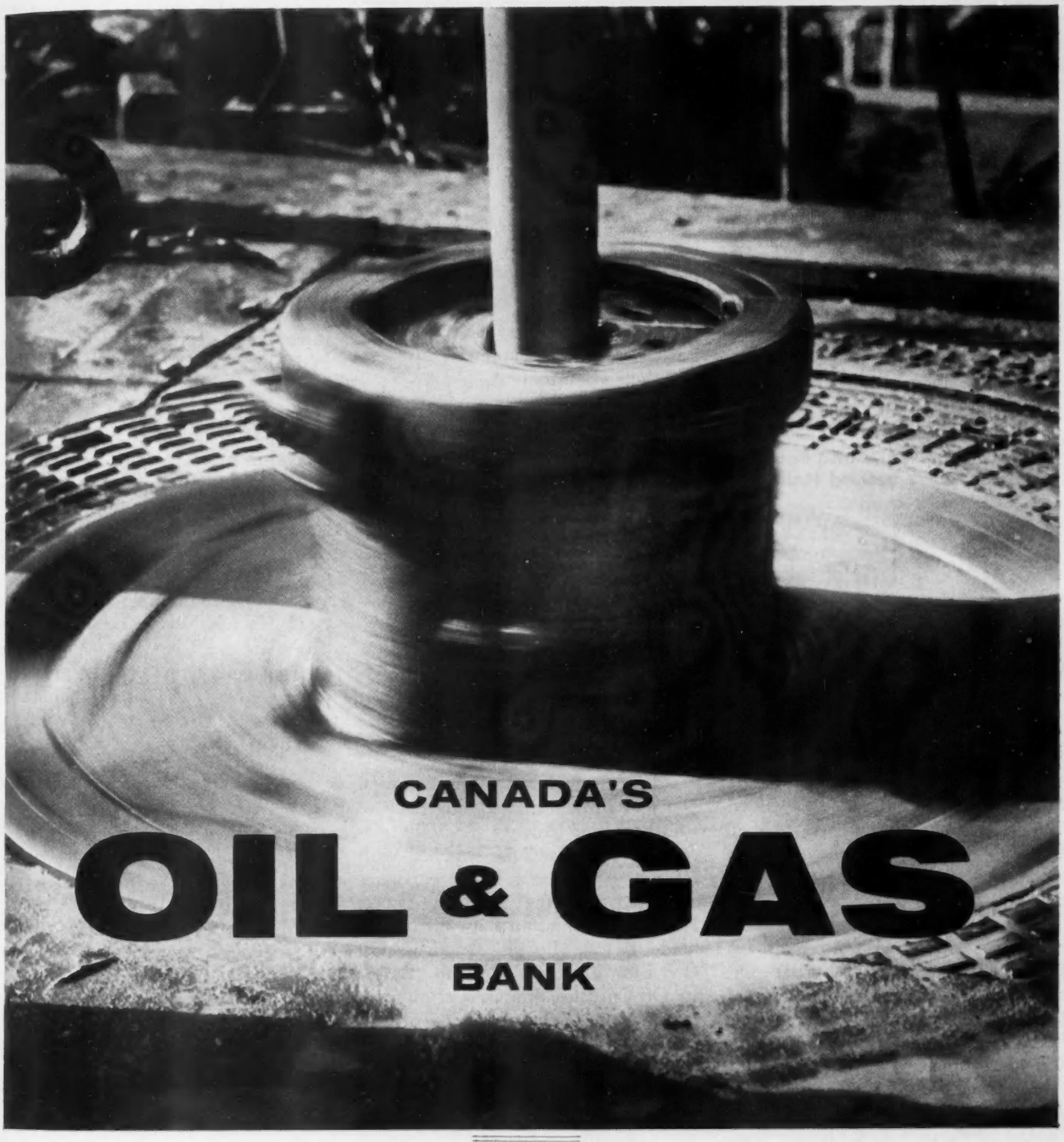
Operator for the discovery team planned 15 wells this year, and other companies were continuing active drilling programs. Producing horizon is topped at about 8,500 feet, and pay thickness ranges from 40 to almost 170 feet. Recoverable reserves were reported to have been estimated at about 15 million barrels.

The discovery well was drilled in June, 1957, and 35 oil wells had been completed up to mid-April, 1958. Indications were that between 80 and 100 wells would be required to fully develop the producing area, based on 80-acre spacing, and ultimate crude recovery could amount to 50 million barrels.

**Foothills gas discoveries.** Uncertainty surrounding the natural gas export question adversely affected gas drilling, and, as a result, most gas discoveries were incidental to the search for oil. Waterton Park and Castle River discoveries, made by Shell Oil Company and Texaco Exploration Company, respectively, were exceptions. And these companies followed up with drilling operations which resulted in discovery of a field more than 18 miles long, undefined at either end, with reserves that should rival Pincher Creek as the largest natural gas reservoir in Canada.

Prior to completion of the present north and south wells—and with only three gas completions—Alberta's Conservation Board set recoverable gas reserves for the field at 550,000 MMcf.

The new discovery area lies about parallel to Pincher Creek, about 10

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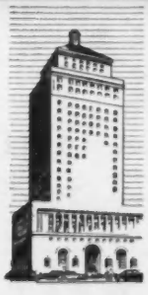
In Calgary the Royal Bank's Oil and Gas Department is set up to provide banking facilities geared to the particular needs of oil and gas men. Officers are practical oil bankers, with long experience in the business. This department's current "Oil and Gas Bulletins"—dealing with regulations, tariffs, financing, basic statistics and kindred subjects—are available on request to The Royal Bank of Canada, Oil and Gas Department, 409 Eighth Avenue West, Calgary, Alta.



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## Drilling Gain Predicted in Western Canada

**Drilling activity in Western Canada is expected to be considerably higher during the last six months of 1958 than in the first half of the year. WORLD OIL forecasts the drilling of 1,450 wells and 7,870,000 feet of hole during the last half of the year. This would be 30 percent more wells and footage than the 1,113 wells and 6,102,959 feet of hole drilled in the first six months of 1958.**

**The above drilling rate would mean the completion of 2,563 wells and the drilling of 13,972,959 feet of hole during the 12 months of 1958. This could be 14.4 percent fewer wells and slightly more footage than was drilled during 1957.**

**WORLD OIL's forecasts are based on a survey of the drilling plans of Western Canadian operators.**

**These figures are exclusive of Eastern Canada, where 450 to 475 wells are usually drilled annually.**

**Forecast of Wells and Footage to Be Drilled in Western Canada During Second Half of 1958 and in the Year 1958**

| | WELLS DRILLED | | | FOOTAGE DRILLED | | |
|---|---|---|---|---|---|---|
| | 1958 Forecast | 1957 | Percent Change | 1958 Forecast | 1957 | Percent Change |
| Last Six Months | 1,450 | 1,537 | —15.7 | 7,870,000 | 7,092,186 | +11.0 |
| First Six Months | 1,113 | 1,456 | —23.6 | 6,102,959 | 6,876,323 | —11.3 |
| Twelve Month Total | 2,563 | 2,993 | —14.4 | 13,972,959 | 13,968,509 | +0.03 |

miles west. Producing zone is in the Mississippian found below 10,000 feet. To cut drilling time and costs, Shell Oil Company was experimenting with turbodrilling, the first time the turbodrill has been used in Canada.

This field could play an important role in gas export south into the U. S. if the move should be authorized. Or, an outlet possibly may be found through the currently building Alberta Gas Trunk Line and Trans Canada systems.

Gas from the field is contracted to Alberta & Southern Gas, a firm backed by Pacific Gas & Electric Company of San Francisco. The firm proposes to export 450 MMcf of Alberta gas daily through a $330 million pipe line to its markets in California.

Other 1957 Alberta Foothills discoveries which will be watched with interest, particularly is gas export is approved, are the Stolberg, Lovett River and Mountain Park discoveries made by the British American Oil Co., Ltd., Triad Oil Co. Ltd., Royalite Oil Co. Ltd., Sun Oil Co. on acreage 140 miles north-northwest of Calgary.

**Lambert Creek.** When Lambert Creek 6-4-51-21 was drilled past 14,820 feet and was finally completed at 15,195 feet late last year, it set a new Canadian depth record. Production tests of the D1 gas zone below 12,800 feet proved the show non-commercial despite the fact that it blew at a 10 MMcf rate on drillstem test. Subsequently, the well was abandoned.

**Pembina.** Pembina continued to produce a larger percentage of Alberta's production than any other field. Average production rate ran as high as 135,000 barrels a day during the first part of the year. Proration affected its production rate, just as it affected all Alberta's fields, and these allowable rates have decreased steadily since mid-1957. In May, 1958, the per-well allowable dropped to 44 barrels daily.

Secondary recovery projects initiated in 1956 have become widespread. A major project which was getting under way this year at Pembina was the installation of a multi-million dollar gas conservation system. Gas thus recovered will be delivered by pipe line to Edmonton.

By the time the field is fully developed, all feasible secondary recovery projects have been put in operation and gas conservation plants are operating, major operators in Pembina estimate that of total of $675 million will have been spent.

### SASKATCHEWAN

The province of Saskatchewan, in 1957, gained prominence in becoming a major crude producing area. Although exploration drilling results failed to better the significant records set in 1956, development drilling rose substantially, and over-all industry operations advanced market markedly.

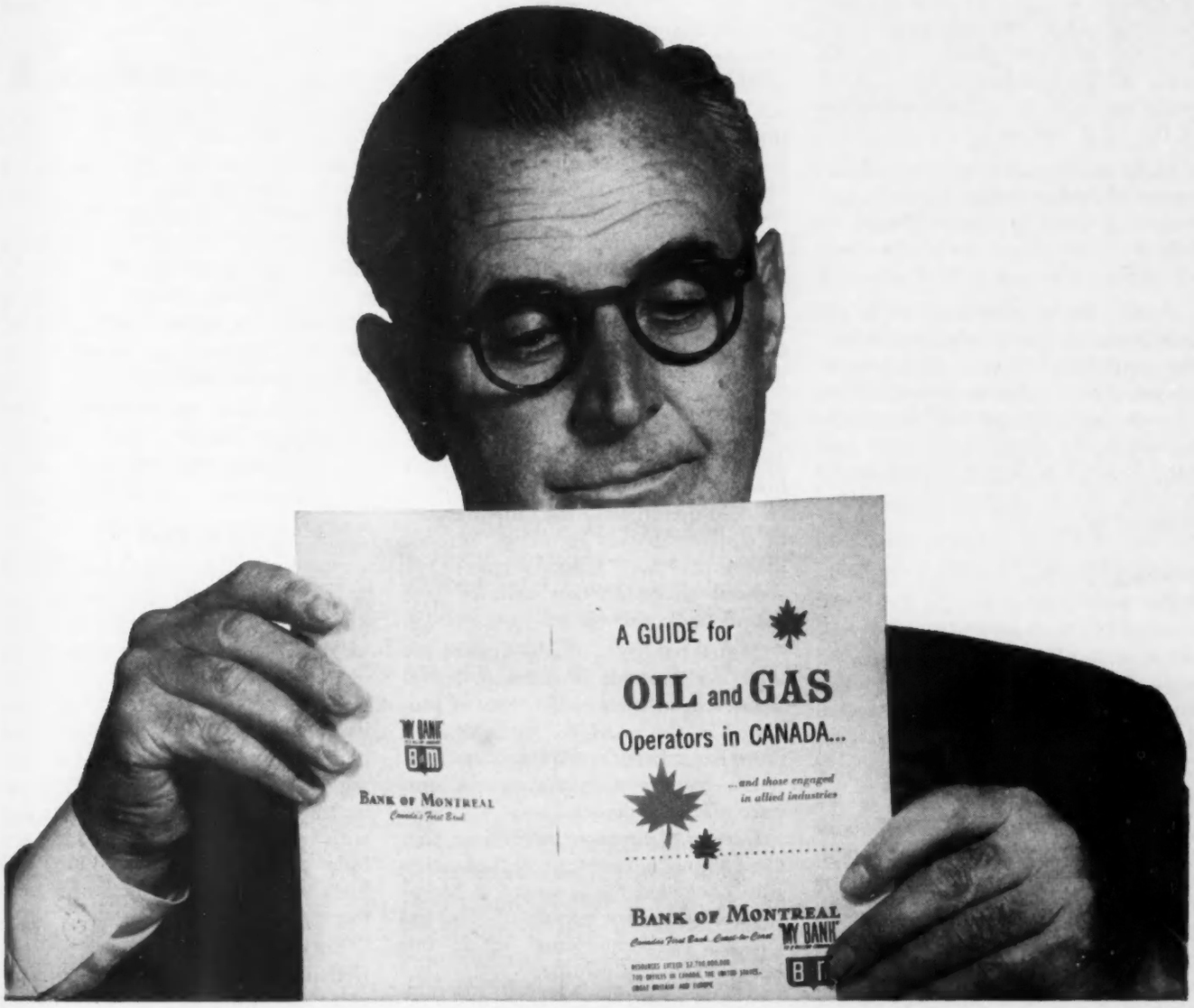
Production records were broken almost monthly in Saskatchewan, and December's output reached an average of 122,717 barrels daily. The 1957 record was not to stand long, however, as January set a new mark, and February production raised the level still higher as the daily average rose to 127,361 barrels. Part of the increased rate has been gained at the expense

**Western Canada Drilling Results During First Half of 1958 and 1957**

| Province | Year | WELL COMPLETIONS Oil | Gas | Dry | Total | Footage |
|---|---|---|---|---|---|---|
| Alberta | 1958 | 398 | 70 | 236 | 704 | 4,008,601 |
| | 1957 | 462 | 55 | 191 | 708 | 3,830,733 |
| British Columbia | 1958 | 4 | 18 | 30 | 52 | 271,178 |
| | 1957 | 2 | 12 | 6 | 20 | 111,215 |
| Saskatchewan | 1958 | 213 | 0 | 90 | 303 | 1,697,087 |
| | 1957 | 431 | 0 | 174 | 605 | 2,644,141 |
| Manitoba | 1958 | 30 | 0 | 17 | 47 | 91,093 |
| | 1957 | 78 | 0 | 39 | 117 | 263,781 |
| Northwest Territories | 1958 | 0 | 0 | 7 | 7 | 35,000 |
| | 1957 | .... | .. | .... | n.a. | n.a. |
| **Total** | **1958** | **645** | **88** | **380** | **1,113** | **6,102,959** |
| | **1957** | **973** | **67** | **410** | **1,452** | **6,849,870** |

**Western Canada's Producing Wells at Jan. 1, 1958**

| Province | Wells Flowing | Wells Pumping | Total Wells Capable of Prod. | Total Wells Actually Prod. |
|---|---|---|---|---|
| Alberta | 3702 | 4313 | 8015 | 7136 |
| Saskatchewan | 763 | 2468 | 3231 | 2652 |
| Manitoba | 12 | 836 | 848 | 734 |
| British Columbia | 17 | 3 | 20 | 20 |
| NWT | 62 | .... | N.A. | 62 |
| Total | 4,556 | 7,620 | 12,114 | 10,604 |

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of Alberta, but not all of it because Saskatchewan's medium gravity oil does not compete directly with Alberta oil for markets. This type of crude amounts to a fair percentage of the total output.

Light gravity fields in the southeast corner of Saskatchewan have cut into eastern markets previously served by Alberta fields since the former are about 600 miles nearer those markets.

Availability of good markets for the province's oil has made unnecessary the implementation of allowable quotas, and producers are operating at near maximum permissible rates in all fields. At the end of 1957 and early in 1958, a market existed for 90 percent of the province's potential production.

**Drilling.** Drilling activity resulted in 1,227 well completions in 1957, including 345 wildcats and 882 development wells. Results showed 853 oil wells, 16 gas wells and 358 dry holes. In 1956, well completions totaled 1,108 with 347 wildcats and 761 field wells that resulted in 784 oil wells, 12 gas wells and 312 dry holes.

The high discovery rate of 1956, of course, was not maintained throughout last year. As the discovery ratio fell off and became more in line with that of other Canadian provinces and adjacent U. S. areas, more emphasis was placed on deeper horizons. Important shows were reported at some of the deep test wildcats, including Imperial Oil Ltd.'s Hummingbird 6-13-2-19 Ordovician oil discovery 90 miles south of Regina and 25 miles northeast of the Outlook field of northern Montana. Pump production tests of the 9,870-9,879-foot interval yielded 120 barrels daily including 40 percent 33-gravity crude. The well was abandoned as non-commercial after extensive production tests, but the shows were considered highly significant.

Secondary recovery projects and gas conservation projects also were getting under way in Saskatchewan.

**Pipe lines.** Pipe line construction remained at a high level. Although Trans-Canada had completed its main transmission line building program in this province, the Saskatchewan Power Corporation has large-scale distribution expansion plans under way.

## MANITOBA

Most easterly of the four western provinces, Manitoba maintained its production rate at about 16,500 barrels daily during 1957 and was continuing at the same rate in 1958. Exploration activity was greater in Manitoba last year than in 1956, but fewer discoveries were recorded.

The new discoveries did not generate any large amount of development work or significant amount of new reserves. The province was the only one in western Canada to record a drop in reserves due to production.

The 225 well completions—150 field and 75 exploratory—resulted in 117 new oil producers and 108 dry holes. Only four oil discoveries were chalked up. In 1956 the same number of discoveries was recorded, but out of the 254 well completions 191 showed oil production and 63 were abandoned as dry holes.

Manitoba has a ready market for all of its available production. Its refineries process more oil than is produced in the province. Discoveries to date have been confined to a relatively small sector in the southwest part of the province.

Deeper exploratory operations that are gaining momentum in Saskatchewan could aid the industry in Manitoba, if they are successful. Natural gas has not been found yet in this province in any volume.

## NORTHWEST TERRITORIES AND YUKON TERRITORY

Changes in leasing regulations and an extensive road building program were expected to further encourage exploration activity in Northwest Territories and Yukon Territory.

Territorial oil and gas regulations were being revised so as to make exploration more attractive to oil companies. The new regulations will extend the life of a permit from six to nine years. Issuance of oil and natural gas permits, suspended in September, 1957, will be resumed when the revised regulations go into effect. Since the suspension date, applications for permits covering some 30 million acres have been received.

A large road building program, scheduled for completion in 1962, has been announced by the Canadian government. Two main roads are planned, one running on the west side and the other on the east side of the Mackenzie River. Northern terminals of both will reach into the Arctic Circle.

## ONTARIO

Highlight of activity in Ontario during 1957 was a shift of emphasis to lake drilling in Lake Erie for gas development. Drilling activity in general, however, remained at about the same pace as existed in 1956. Geophysical activity during 1957 increased by about 50 percent with an additional 13 party months, with efforts directed mainly toward evaluation of Lake Erie holdings.

Land activity was curtailed during the year, with a drop of almost 600,000 acres from those held the previous year.

## QUEBEC

Drilling activity in Quebec doubled in 1957, following the encouraging shows of natural gas in the latter part of 1956. Although some shows of gas were encountered in a few of the wells drilled, the results of the majority of the operations were discouraging in the St. Lawrence Lowlands region. Rotary drilling was introduced to the St. Lawrence Lowlands area with two holes deepened and two new holes drilled to basement. One of the holes was partially drilled with air as the circulating medium.

Some fill-in gravity work was carried out during the year, and a few new lines were run on the northern edge of the basin.

## NEW BRUNSWICK

New drilling activity is indicated for New Brunswick. In 1957, New Brunswick Oilfields, Limited, entered into an agreement with Imperial Oil Limited whereby Imperial will pay $200,000 for a seven-year sublease of approximately 1 million acres of the New Brunswick property.

Imperial is committed to spend a minimum of $400,000 on exploration and development in the next three years and, unless the agreement is then terminated, to spend at least $1 million over the seven-year period. Royalties of all oil and gas produced will include 5 percent to the province, and an additional 7½ percent to New Brunswick oilfields. Imperial may obtain a partial assignment of the acreage for each producing well completed, and all or part of the 1 million acres upon spending the $1 million minimum.

# Alaska . . . Richfield discovery in late 1957 sparks increased exploration activity

A PRONOUNCED quickening in exploratory activity occurred in Alaska when, in September, 1957, a major oil discovery was made by Richfield Oil Corporation at a wildcat location on the Kenai Peninsula, near Cook Inlet, about 40 miles southwest of Anchorage. Leasing in various sections of Alaska, already moderately active, suddenly increased and, in short order, the U. S. Bureau of Land Management was swamped with lease applications.

Major and independent oil companies, many of which have joined forces to hold down the very high costs involved in exploratory operations, suddenly became aware that Alaska, with at least eight large sedimentary basins scattered throughout its 586,400 square-mile area, was potentially an excellent prospecting area.

The discovery well, Swanson River Unit 1, located on a 71,600-acre block, was drilled to total depth of 12,384 feet and plugged back to 12,000 feet and completed with perforated interval in Tertiary beds between 11,150 and 11,215 feet. It was completed and flow-tested for a limited time for 900 barrels per day of 30-gravity crude cutting less than one percent, along with 122 Mcf of gas through 1½-inch bean. Gas-oil ratio was comparatively low, being in the order of 150 to 200 cubic feet per barrel.

The well was shut in pending arrangements for market outlets and further evaluation of the area. Shortly after it was shut in, tubing pressure on the well rose to 1600-1650 pounds per square inch, with the fluid column at or near the surface.

Further impetus was given the area when, shortly after the Richfield discovery was announced, Standard Oil Company of California, with $30 million committed to drilling and exploratory work, joined Richfield, with a pooling of acreage, on a 50-50 basis, with Standard becoming operator.

The second well, a two-mile southerly step-out from the discovery, was drilled. It encountered the same productive sand as in the first well, indicating that the Kenai discovery could be on a very large structure.

Unofficial word is that the sand in the second well looked "as good" as that found in the discovery well. A string of 7-inch casing was run in and cemented at 11,650 feet to protect the zone and drilling was carried on down to 12,046 feet where, in mid-February of this year, operations were suspended and the rig moved to a new location, the Deep Creek Unit near Ninilchik, some 50 miles southwest of the Swanson River Unit.

**Activity speeding up.** In all areas, exploration, including seismic, gravity and surface, picked up briskly. Between July, 1957, when word of Richfield's impending discovery began to spread, and the end of the year, the U. S. Bureau of Land Management reported that applications for leases on more than 16 million acres had been received. By early 1958, other important deep tests in other sectors had been spudded and were reaching depths at which productive zones might be expected.


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Shell Oil Company, in an agreement with Humble Oil & Refining Company, with the latter as operator, in September, 1957, spudded in on a scheduled 12,000-foot wildcat test in the Wide Bay-Kanatak area on the Alaska Peninsula, across Cook Inlet and about 280 miles southwest of the Richfield discovery. Under the agreement, Humble was to drill the first three wells to earn a 50 percent interest in the Shell acreage.

The initial test well, Bear Creek Unit 1, by mid-1958 had reached 10,867 feet and was attempting to whipstock to by-pass a fish in the hole. Unofficial reports indicated this test already had encountered interesting shows of oil and gas up the hole but that the well would be drilled on down to the scheduled 12,000-foot depth. A 9⅝-inch protection string had been cemented at 6,516 feet.

Colorado Oil and Gas Corporation, with two deep wildcat tests already drilled and abandoned over the past year or two in the Yakutat area some 400 airline miles east-southeast of the Kenai area, shortly after mid-1958 was readying plans to drill a third test slated to go to 11,000 feet. The first two wells had encouraging, though non-commercial, shows of oil and gas at intervals between around 9,500 and 10,600 feet.

The Colorado Oil and Gas tests are southeast of the Yakataga-Icy Bay area where, between 1953 and 1957, Phillips Petroleum Company and Kerr-McGee Oil Industries, Inc., drilled a series of three tests on a million-acre block of leases. The first test was a 4837-foot stratigraphic test hole, the second went to 10,013 feet and the third to 12,054 feet.

The deep tests, encountering extremely hard drilling conditions, found oil sands, but the wells were abandoned as non-commercial. An estimated $8 million was spent by the Phillips-Kerr-McGee group. No plans had been announced as to the future work planned for the area.

**Susitna Flats.** Anchorage Gas & Oil Development Company, in the Susitna Flats area 25 to 30 miles north of Anchorage, with two tests under way, by mid-1958 had drilled its Rosetta 1 to 4,049 feet and was pre-

paring to test. Its Rosetta 3 was drilling ahead at 5,582 feet.

Across Cook Inlet, in the Chinitna Bay area, Iniskin Unit Operator, Inc., a subsidiary of Havenstrite Oil Company, Los Angeles, has been drilling during summer seasons on a deep test since 1954. At a depth of about 9,775 feet, the well was drilling ahead. Last summer, a string of 7-inch casing was cemented at 9,450 feet, and tests of shows were made from 6,300 feet to bottom.

Tests have indicated encouraging though non-commercial shows of 50- to 52-gravity oil. Objective of this well is the Jurassic contact zone. The structure is a northeast-southwest trending anticline some 8 to 9 miles wide by 30 to 50 miles long. Surface formations are estimated to be of Middle Jurassic and the well still is in Jurassic. With an estimated 10,000 feet of formation missing (eroded), it is considered to be the thickest section of Jurassic in the world.

**Alaska's deepest well.** Standard Oil Company of California, operator, drilling its first test of the Deep Creek Unit in the Ninilchik area about 50 miles southwest of the Swanson River Unit discovery, by mid-July, 1958, had reached total depth of 14,221 feet. No details had been released by Standard, but the company reportedly was plugging back to 11,755 feet to set whipstock for redrilling to obtain additional geological information. This well, spudded March 19, 1958, is the deepest well drilled to date in Alaska.

Exploratory work on the Kenai Moose Range, until recently held up, is expected to pick up following the mid-1958 action of the Fish and Wildlife Service in granting permission to conduct geophysical work in that previously-restricted area, providing the work is done by helicopter.

According to a July, 1958, report of the Alaska Department of Mines, at least 17 companies now have parties working in various parts of Alaska and are using at least 51 helicopters in conjunction with their field work. The extensive use of helicopters points up the severe terrain and general access problems confronting operators venturing into the little-explored and sparsely-populated areas in the interior of Alaska.

In late July, 1958, the Interior Department announced that oil and gas leasing could proceed on some 4 million acres adjoining the Gubic (gas) structure of northern Alaska, and on open areas of the Kenai National Moose Range.

This new (Gubic) area being opened for exploration adjoins the Naval Petroleum Reserve 4 which, during World War II, was explored and partially developed by the Navy. In the Umiat area of that reserve, near the Gubic gas field mentioned above, the Navy discovered 36-gravity crude at depths of only about 1,000 feet; several of the wells having produced at rates of from 100 to 250 barrels per day. Oil reserves in that area alone, it is estimated, may range from 50 to 75 million barrels. Oil was found, also in the Cape Simpson area, about 100 miles east of Point Barrow.

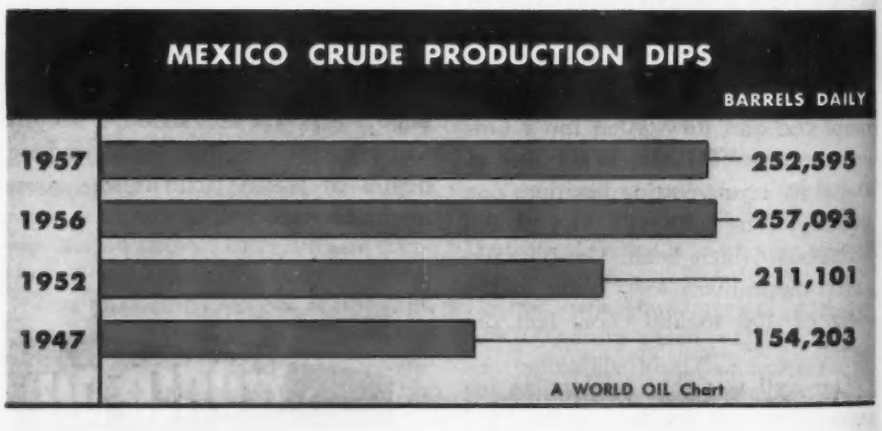
**Outlook.** Developments pointing to a potentially bright future for Alaskan oil include:

- Known occurrences of oil, including the Kenai Peninsula discovery which some estimates have indicated may be a billion-barrel field.
- Encouraging shows found thus far in other deep tests in southern Alaska.
- Known reserves existing in the Naval Petroleum Reserve area.
- The old Katalla field 50 miles southeast of Cordova which produced 154,000 barrels of 40- to 50-gravity oil from shallow depths between 1902 and 1933 from 18 wells.

Some idea of the potentially productive area involved in Alaska, now the 49th State, can be gained from figures recently published by the Alaska Department of Mines. About one-third of Alaska's area—

- About 110 million acres are classified as geologically favorable for oil development. Of this acreage, 24 million acres are within Naval Petroleum Reserve 4 and 2 million are in the Kenai Moose Range.

Of the remaining 85 million acres, about 30 million already have been leased and the remainder, it was expected, probably will be leased by about 1960.




# Mexico . . . 1958 production moves upward following a year of decreased output credited to oversupply and recession

MEXICO EXPERIENCED some letdown in oil industry operations in 1957, along with other Western hemisphere countries. The curtailment reflected the slowing down of business in general and the oversupply situation in the hemisphere, in the wake of the temporary shortages of the Suez crisis early in the year.

**Production.** Mexico's production of crude oil and natural gas liquids in 1957 averaged 252,595 barrels daily. That was a decrease of 4,499 barrels

or 1.7 percent from the 257,094 barrels per day produced in 1956.

Output dropped to 42,204 barrels daily in 1957 from 60,447 in 1956 in the New Golden Lane fields. But that decline was partially offset by an increase of the Poza Rica field's production to 123,908 barrels daily from 116,984. Similarly, a drop in the Central Zone was partially compensated by an increase in the Tampico district. Also helping to offset decreases were the fields of the Isthmus of Tehuantepec, which rose to 31,914 barrels daily in 1957 from 23,457 barrels in 1956.

The number of oil producing wells in Mexico at the end of 1957 stood at 1,931, an increase of 208 over one year previously. Gas producing wells increased to 115 from 32. Wells shut in decreased to 817 from 851.

In April, 1958, Mexico's production of crude oil and natural gas liquids had increased to 267,042 barrels daily.

Natural gas production in Mexico in 1957 amounted to 163,949 MMcf, an average of 449 MMcf daily. The gas output was 31.4 percent above that of 124.791 MMcf.

**Drilling.** Petroleos Mexicanos, the government agency operating Mexico's oil industry, completed 389 wells in 1957. That was 17 wells less than the 406 completed in 1956. However, the wells of 1957 were deeper, on average, and the total amount of footage drilled increased to 2,513,160 feet in 1957 from 2,172,387 feet in 1956.

Exploratory drilling was increased in 1957, although development drilling was curtailed. There were 108 wildcats completed, compared with only 88 the year before. The increase in wildcatting was well scattered over the country.

Development wells completed in 1957 totaled 281, a decrease of 37 wells or 11.6 percent from the 318 of 1956. A large part of the curtailment was carried out in the Poza Rica district. Drilling was reduced only slightly in most of the other districts.

At the end of 1957, a total of 68 wells were drilling in Mexico.

**Reserves.** Crude oil and distillate reserves of Mexico's fields as of Dec. 31, 1957, were officially estimated at 2,065,760,000 barrels. The country's natural gas reserves were estimated as having the energy equivalent of 1,307,580,000 barrels oil. Together, the oil and gas represented reserves equivalent to a total of 3,373,340,000 barrels.

**Refining.** At the close of 1957, Pemex operated eight petroleum refineries, with combined crude charging capacity of 308,000 barrels daily. Those plants in 1957 ran to stills an average of 236,628 barrels daily. Those runs were equivalent to 93.7 percent of the Mexican crude and distillate production. Some crude was used as fuel, and some was exported.

In 1957 Mexico exported slightly more crude oil and fuel oil than the volume of petroleum and derivatives imported. However, the value of the exported oils was less than one half of the cost of the oils imported. The imports included substantial quantities of refined products relatively high in price.

## Natural Gas Production in Mexico in 1957, by Districts

(In Millions cubic feet)

| REGION | Amount 1957 | Daily Average |
|---|---|---|
| **Poza Rica:** | | |
| Poza Rica | 80,199 | 220 |
| New Golden Lane | 12,850 | 35 |
| **Tampico:** | | |
| North | 2,263 | 7 |
| South | 2,200 | 6 |
| **Central Zone** | 606 | 2 |
| **Frontera N. E.** | 56,028 | 153 |
| Isthmus of Tehuantepec and Tabasco | 9,443 | 26 |
| Total | 163,949 | 449 |

## Oil and Natural Gas Reserves in Mexico at End of 1957

| | |
|---|---|
| 1. Barrels of proved oil reserves as of December 31, 1957, including crude oil and distillate | 2,065,760,000 |
| 2 Barrels equivalent of proved natural gas reserves, December 31, 1957: | |
| Calorific equivalent to crude at the rate of 5000 cubic feet = 1 barrel crude | 1,307,580,000 |
| Total barrels of reserves of oil and of gas in oil equivalent | 3,373,340,000 |

## Drilling in Mexico in 1957, by Areas

(All by Petroleos Mexicanos, Government Agency.)

| DISTRICT | WELLS COMPLETED IN 1957 | | | Total Footage Drilled in 1957 (Feet) | Number of Wells Drilling Dec. 31, 1957 | WELLS COMPLETED IN 1957 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Development Wells | Wildcats | Total Wells | | | Oil | Gas | Dry | Total |
| Poza Rica: | | | | | | | | | |
| Poza Rica and New Golden Lane | 88 | 24 | 112 | 914,200 | 26 | 88 | .. | 24 | 112 |
| Tampico: | | | | | | | | | |
| North | 34 | 5 | 39 | 231,406 | 13 | 35 | .. | 4 | 39 |
| South | .. | 14 | 14 | 59,452 | 2 | .. | .. | 14 | 14 |
| Central Zone | 4 | 21 | 25 | 172,181 | 5 | .. | 2 | 23 | 25 |
| Frontera NE | 29 | 23 | 51 | 387,337 | 10 | .. | 35 | 16 | 51 |
| Southern Zone | 127 | 21 | 148 | 748,584 | 12 | 82 | 31 | 35 | 148 |
| Total | 281 | 108 | 389 | 2,513,160 | 68 | 205 | 68 | 116 | 389 |

## Crude Oil Production in Mexico (including absorption liquids)

(Barrels)

| DISTRICT | Daily Average | | | | |
|---|---|---|---|---|---|
| | April, 1958 | 1957 | Year 1957 | Daily Average in 1956 | Year 1956 |
| **Poza Rica:** | | | | | |
| Poza Rica | 141,936 | 123,908 | 45,226,389 | 116,984 | 42,815,980 |
| New Golden Lane | 28,969 | 42,204 | 15,404,588 | 60,447 | 22,123,735 |
| **Tampico** | | | | | |
| North | 23,477 | 22,938 | 8,372,210 | 20,372 | 7,456,033 |
| South | 14,331 | 15,385 | 5,615,610 | 16,222 | 5,937,214 |
| **Central Zone** | 5,994 | 10,928 | 3,988,790 | 14,986 | 5,485,070 |
| **Frontera N. E.** | 7,204 | 5,318 | 1,941,210 | 4,626 | 1,693,285 |
| **Southern Zone:** | | | | | |
| Isthmus of Tehuantepec and Tabasco | 45,131 | 31,914 | 11,668,500 | 23,457 | 8,585,038 |
| Total | 267,042 | 252,595 | 92,197,297 | 257,094 | 94,096,355 |

## Mexico Well Data

(At End of 1957)

| REGION | No. of Crude Producing Wells | | | No. of Gas Producing Wells | No. of Wells Shut in |
|---|---|---|---|---|---|
| | Flowing | Artificial Lift | Total | | |
| **Poza Rica:** | | | | | |
| Poza Rica | 186 | 138 | 324 | | 105 |
| New Golden Lane | 110 | ... | 110 | | 34 |
| **Frontera N. E.** | 61 | 33 | 94 | 115 | 33 |
| **Tampico:** | | | | | |
| North | 432 | 89 | 521 | | 284 |
| South | 282 | 8 | 290 | | 114 |
| **Central Zone** | 18 | 6 | 24 | | 3 |
| **Southern Zone** | 168 | 400 | 568 | | 244 |
| Total | 1,257 | 674 | 1,931 | 115 | 817 |

# Central America . . . Numerous oil companies are continuing exploration despite lack of any notable discoveries

EXPLORATORY drilling activities, including wildcats under way this year in British Honduras, the Bahamas and Barbados, highlighted continuing interest exhibited by numerous oil companies in Central America. Details follow:

## Guatemala

Concession-granting activity in Guatemala continued during 1957 and 1958, with new grants raising the total area under concessions to about 10.3 million acres by mid-1958. The only drilling done as of May, 1958, was by Coastal Plains Oil and Gas Company (which previously merged with Sloane Exploration Company) on Concession 24, about 20 miles south of Puerto Barrios in Izabal Province. The test was suspended in the spring at 4,498 feet.

Several companies were conducting core drill programs, gravity surveys and seismic operations on land and in Amatique Bay. Companies spent almost $8.5 million in their search for oil during 1957, providing the government of Guatemala with an income of $959,480.

Guatemala may get its first refinery, a 2,000-barrel-a-day plant, that may be dismantled and shipped from Louisiana. Breaux Bridge Oil Refining Company applied for a license last fall to transfer its Breaux Bridge, La., facilities to Santo Tomas.

## Panama

Sixty-six concessions had been granted in Panama, covering the entire land surface and much of its offshore lands, by early 1958. Tradewinds Exploration of Panama, S A, (J. A. McRae interests) holds three of the concessions totaling 6 million acres along the Gulf of Mosquito Coast on the Caribbean and two tracts on the Pacific side.

Champlin Oil and Refining Company had moved a drilling barge to Chiriqui Lagoon on the Caribbean Coast and reportedly was drilling below 6,000 feet on the first test in July, 1958.

Union Oil Company of California's Yorkin 1 test, located just across the border from the Cocoles area in Costa Rica, remained suspended at 5,554 feet at the end of December, after having found oil and gas shows.

## Nicaragua

Waterford Oil Company's Touche 1, located 25 miles offshore in Nicaraguan waters 50 miles northeast of Puerto Cabezas on an 11-million-acre concession, was abandoned as a dry hole in 1957 at 14,997 feet.

Nicaragua's Chamber of Deputies reportedly was considering new oil legislation late last year.

## Costa Rica

Union Oil Company of California's Cocoles 3 was abandoned in 1957 at 5,740 feet after finding gas shows, and Cocoles 4, spudded April 12, was drilled to 7,063 feet and abandoned. Victoria 1, also located in the Limon area, was drilling at 6,666 feet at year's end.

In April, 1958, Costa Rica reportedly was considering a liberal petroleum code, including a 25 percent depletion provision.

## Honduras

Exploration in Honduras was being continued in 1957 and 1958, following the completion of a dry hole by John W. Mecom of Houston at 6,950 feet at Laguna Canatasca on the Caribbean Coast in 1957.

Interest was continuing as a number of companies validated concessions by drilling shallow wells and conducted exploration operations.

## Bahamas

Exploratory drilling was renewed in the Bahamas in 1958 for the first time since Superior Oil Company abandoned a deep test in 1945. Bahamas Gulf Oil Company and Bahama California Oil Company were drilling a deep test at Cay Sal Bank, about 180 miles southwest of Nassau in 30 feet of water. With $3 million budgeted for the test, it was to be drilled to 15,000 feet. By mid-July, the well was below 9,000 feet.

Gravimetric surveys and seismograph operations were conducted in 1957 by Sun Production Company of Bahamas, Ltd., a Sun Oil Company affiliate.

## British Honduras

British Honduras Gulf Oil Company began a new wildcat drilling program in 1957 in which four dry holes had been drilled. In July, 1958, wildcats were being drilled at Blue Creek 1 in the northwest and at Tower Hill 2.

Prospecting licenses covering both offshore and onshore areas currently are held by a number of oil companies.

## Haiti

During 1957, Commonwealth Oil Company of Houston conducted reconnaissance surface geologic surveys and photogeologic studies of Haiti. The company acquired three additional parcels of 61,775 acres each, pursuant to its concession agreement. The new concessions are in the Plaine Central area.

## Dominican Republic

H. S. Cole, Jr., and son of Houston, operating with Petrolera Dominicana, C A, holder of a 2.1 million-acre exploration permit in the Cibao Valley, completed its first test at Villa Isabel 1 in 1958 which was abandoned 10,800 feet. Cole expected to make immediate location for a second test.

Some shallow core drilling in an oil seep area in the south was reported during 1957.

## Puerto Rico

Early in 1958, the Puerto Rican government announced a liberalizing of its prospecting permits and extension of leasing periods, as well

as the exemption from local taxes for oil and gas producers, in an effort to attract oil exploration to the island.

A. D. Fraser of Kingston, Jamaica, held the largest permit as of mid-1958. Other permit holders include Cataract Mining Corporation, Maritime Oil Company, E. Vidal of Puerto Rico.

## Barbados

On July 9, 1958, Gulf Oil Corporation announced that the Barbados government had formally approved an agreement between Kerr-McGee Industries, Inc., and Gulf. Kerr-McGee will earn a partial undivided interest in Barbados Gulf Oil Company's prospecting license covering the island after reaching a certain stage of a joint project which involves the drilling of Morgan Lewis 1 well.

This test was spudded March 17, 1958, in the Scotland district near Belleplaine, and was drilling below 9,500 feet by the middle of July. A Barbados Gulf company rig was drilling the well, but should production be found and a development program be initiated, it was anticipated that Kerr-McGee might move a rig to Barbados. Morgan Lewis 1 was scheduled to be drilled to 15,000 feet.

During 1957, Barbados Gulf continued testing the high-pressure gas zones found in its Springvale and Friendship wildcats, drilled in previous years to 12,178 feet and 10,799 feet, respectively. Gulf's license was extended in February, 1957, to include 138,000 acres, being all of the island and its offshore waters. No wells were drilled from the time of Friendship 1's completion until the Morgan Lewis test was begun.

## Jamaica

Pan Jamaican Oil Company, formerly Jamaican Stanolind Oil Company, drilled and abandoned its third test during the latter part of 1957 and discontinued all exploration in Jamaica early in 1958. Santa Cruz 1, spudded June 3, 1956, was abandoned in March, 1957, at 8,732 feet. The second test, Cockpit 1, in Trelawny Parish was abandoned at 5,521 feet in May, 1957. The final test, West Negril 1 in St. Elizabeth Parish was abandoned at 9,244 feet late in 1957. The rig reportedly was shipped to Cuba late last year.

# Cuba . . . 1958 daily average oil output expected to drop from 1957's 1,081 bpd unless new oil found

CUBA IN 1957 produced 394,787 barrels of oil, or 1,081 barrels daily, a decrease of 403 barrels or 27.2 percent in the daily average from 1956. The country produced 543,121 barrels, or 1,484 daily, in 1956. Production was 167,001 barrels, or 1,106 daily, in the first five months of 1958. Unless new discovery wells were brought in, it appeared that 1958 production would total about 320,000 barrels, or 877 barrels daily.

**Output of fields.** Production in Jatibonico field, Cuba's largest producer, continued falling slightly in 1957 and 1958. Jatibonico produced 945 barrels of oil per day in January, 1957, but had dropped to 585 barrels daily by April, 1958.

Catalina field improved slightly, producing 12 barrels daily in January, 1957; 34 barrels daily in July, 1957; but was back to 12 barrels daily in January, 1958. Jarahueca produced about 20 barrels a day during 1957, but averaged about 100 barrels daily during the first five months of 1958. Motembo (naphtha) field produced about 12 barrels daily during 1957 and about 10 barrels daily in the first six months of 1958.

Cruz Verde field rose from 91 barrels daily in January, 1957, to 218 barrels a day in January, 1958. Santa Maria field fell from 90 barrels daily in January, 1957, to 68 barrels daily in July, 1957, and to 16 barrels daily in January, 1958. Guanabo, the only field discovery of 1957, rose from 20 barrels daily in January, 1957, to 66 barrels daily in July, 1957, and to 129 daily in January, 1958.

Total production for 1957 and the first five months of 1958 ran slightly in excess of 1,000 barrels daily.

**Wells completed.** Drilling continued relatively active in Cuba in 1957, although the number of wells com-

**Wildcat Drilling in Cuba During 1957**

| PROVINCE | Wildcats Drilling at Dec. 31, 1957 | No. of Wildcats Drilled During 1957 and Results | | | |
|---|---|---|---|---|---|
| | | Oil | Gas | Dry | Total |
| Oriente | 2 | 0 | 0 | 5* | 5* |
| Camaguey | 0 | 0 | 0 | 5 | 5 |
| Las Villas | 2 | 0 | 0 | 8 | 8 |
| Matanzas | 0 | 0 | 0 | 1 | 1 |
| Habana | 2 | 0 | 0 | 11 | 11 |
| Pinar del Rio | 1 | 0 | 0 | 6 | 6 |
| Total | 7 | 0 | 0 | 36 | 36 |

*Includes three core holes of 1288 feet, 3888 feet and 4731 feet.

**Crude Oil Production in Cuba (Barrels)**

| FIELD | 1957 Crude Production | | 1956 Crude Production | | No. of Crude Producing Wells End of 1957 | | Province | Type | No. of Wells Shut In 31, Dec. 1957 |
|---|---|---|---|---|---|---|---|---|---|
| | Daily Average | Year's Total | Daily Average | Year's Total | Flowing | Artificial Lift | | | |
| *Bacuranao-Cruz Verde | 125 | 45,741 | 302* | 110,570 | 0 | 18 | Habana | Crude | 0 |
| †Montembo | 12 | 4,494 | 17 | 6,276 | 0 | 200† | Las Villas | Naphtha | 0 |
| Jarahueca | 22 | 7,846 | 86 | 31,991 | 0 | 5 | Las Villas | Crude | 0 |
| ‡Jatibonico | 741 | 270,568 | 1,077‡ | 394,284 | 0 | 19 | Camaguey | Crude | 0 |
| *Santa Marie del Mar | 77 | 28,475 | 0* | 0 | 0 | 5 | Havana | Crude | 0 |
| ‡Catalina | 26 | 9,467 | 0‡ | 0 | 0 | 1 | Camaguey | Crude | 0 |
| Guanabo | 77 | 28,196 | 0 | 0 | 0 | 1 | Havana | Crude | 0 |
| Total | 1,081 | 394,787 | 1,484 | 543,121 | 0 | 249 | ..... | ..... | 0 |

*Bacuranao- Cruz Verde and Santa Maria del Mar production were combined in 1956 for statistical purposes.
†Motembo wells are stripper wells, averaging .085 barrels per well per day in 1956 and .06 barrels per well per day, in 1957 recovery is by bailing.
‡Jatibonico and Catalina production were combined in 1956 for statistical purposes.

**Development Drilling in Cuba During 1957**

| FIELD | No. of Field Wells Completed In 1957 and Results | | | | No. of Field Wells Drilling at Dec. 31, 1957 | Amount of Footage Drilled In 1957 (in feet) |
|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Total | | |
| Bacuranao-Cruz Verde | 11 | 0 | 6 | 17 | 4 | 23,739 |
| *Motembo | 12* | 0 | 8 | 20 | 4 | 23,847 |
| Jarahueca | 0 | 0 | 2 | 2 | 1 | 7,799 |
| Jatibonico | 0 | 0 | 1 | 1 | 0 | 1,820 |
| Santa Maria del Mar | 0 | 0 | 2 | 2 | 2 | 9,801 |
| Catalina | 0 | 0 | 4 | 4 | 1 | 31,100 |
| Guanabo | 3 | 0 | 4 | 7 | 1 | 26,980 |
| Total | 26 | 0 | 27 | 53 | 13 | 125,086 |

*Natural distillate (naphtha) producers.

pleted fell to 89 from 101 in 1956, a decrease of 11.9 percent.

Both development and exploratory drilling were less active in 1957 than in 1956. The number of development wells completed declined to 53 from 59, and wildcats completed dropped to 36 from 42.

**Footage drilled.** The amount of footage drilled in Cuba in 1957 declined more sharply than well completions. It fell to 195,859 feet in 1957 from 278,515 feet in 1956, a drop of 29.7 percent. Operators drilled both fewer and shallower wells. The average depth per well decreased to 2,201 feet from 2,758 feet in 1956.

Excluding core drilling, footage drilled in Cuba amounted to 278,515 feet in 1956; 195,859 feet in 1957; and 83,631 feet in the first six months of 1958.

If no change were brought about by new discoveries, it appeared that about 100,000 feet of hole would be drilled in the last six months of 1958, making the estimated total for 1958 about 185,000 feet.

**Rigs running.** On Jan. 1, 1957, there were 9 rotary and 13 cable tool rigs active in Cuba. On Jan. 1, 1958, 6 rotary and 12 cable tool rigs were active.

In 1956 there were 16 rotaries in Cuba. Four new arrivals brought the total to 20 in 1957. In the first six months of 1958, 2 rotaries had been shipped out, leaving 18 on the island.

**Drilling programs.** Several major companies and independent operators have announced drilling programs or have drilling programs under way. The majors are in the preliminary stages of their exploration programs. They have taken the dominant role held previously by independent wildcatters.

**Field development.** Only one small field, Guanabo, on the north coast of Habana province near the city of Havana, was discovered in 1957. The discovery well was drilled in 1956, but no commercial production was obtained until January, 1957, when a bottom hole heating unit was installed.

In 1957 considerable development drilling occurred in Bacuranao-Cruz Verde and, to a lesser extent, in Motembo and Guanabo fields.

# Trinidad . . . Almost all companies share in 18.1 percent upturn in production during 1957

CRUDE OIL production in Trinidad in 1957 totaled 34,063,287 barrels, an average of 93,324 barrels daily. It showed an increase of 18.1 percent from the previous year's production of 28,928,768 barrels, or 79,040 barrels daily.

Nearly all of the dozen companies operating in Trinidad shared in the increase in production in 1957.

**Wells completed.** The number of wells completed in Trinidad increased by 19.8 percent to 314 in 1957 from 262 in 1956. That increase was about the same as the expansion of crude oil production. Of the 314 wells completed last year, 282 wells or 89.8 percent of the total yielded oil. That was a better success ratio than in 1956, when 225 oil wells represented 87.0 percent of the total drilled.

The average number of drilling rigs in operation increased to 29 in 1957 from 27 in 1956. Total footage drilled rose to 1,322,483 feet from 1,110,745.

**Development.** During 1957, Dominion Oil Ltd. carried out a slimhole drilling program in the Gulf of Paria from a floating platform. The depths reached exceeded those previously attained by other companies using a similar technique. Dominion Oil is a subsidiary of the Standard Oil Company of California.

Trinidad Petroleum Development Company temporarily abandoned the well Cedros 7 at a depth of 8,800 feet. A deep test well at Los Bajos and another at Palo Seco were completed at depths of 9,632 feet and 11,788 feet, respectively. In the Rock Dome area, a discovery well was completed in the Herrera formation. The British Petroleum Company recently has acquired a controlling interest in this company.

See Insert Map

Shell Trinidad Ltd. drilled four regional appraisal wells in the Ortoire area in southeast Trinidad without finding new production. But the company was successful with four well completions in its new Inniss field.

A deep test well drilled by Apex Trinidad in the Cedros district was completed at a depth of 13,045 feet. Kern Trinidad Oilfields drilled an

**Drilling in Trinidad**
(All Companies)

| TYPE | WELLS COMPLETED IN 1957 | | | | | WELLS COMPLETED IN 1956 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Total | Percent Successful | Oil | Gas | Dry | Total | Percent Successful |
| Exploratory Tests | 5 | .. | 14 | 19 | 26.3 | 2 | 1 | 19 | 22 | 13.6 |
| Development Wells | 277 | .. | 18 | 295 | 93.9 | 223 | 2 | 15 | 240 | 93.3 |
| Total | 282 | .. | 32 | 314 | 89.8 | 225 | 3 | 34 | 262 | 87.0 |

**Oil and Natural Gas Production in Trinidad**

| COMPANY | CRUDE OIL PRODUCTION (In Barrels) | | | NATURAL GAS PRODUCTION (In Mmcf) | |
|---|---|---|---|---|---|
| | 1957 | 1956 | Cumulative Through 1957 | 1957 | 1956 |
| Antilles Petroleum Company, Ltd. | 2,663,458 | 2,432,678 | 18,217,314 | 4,025 | 3,343 |
| Apex (Trinidad) Oilfields, Ltd. | 3,033,546 | 2,982,825 | 111,224,938 | 3,848 | 4,128 |
| Dominion Oil, Ltd. | ..... | ..... | ..... | ..... | ..... |
| Kern Trinidad Oilfields, Ltd. | 1,093,318 | 1,093,588 | 21,497,449 | 583 | 544 |
| Premier Consolidated Oilfields, Ltd. | 407,310 | 410,740 | n.a. | 239 | 39 |
| Shell Trinidad, Ltd[1] | 9,051,058 | 7,277,144 | 132,805,518 | 15,787 | 13,430 |
| Siparia Trinidad Oilfields, Ltd. | 10,527,264 | 1,531,141 | 205,593,516[3] | 21,448 | 2,076 |
| The Trinidad Oil Company[2] | | 6,853,098 | | | 13,594 |
| Trinidad Northern Areas, Ltd. | 1,030,243 | 642,632 | 2,245,223 | 1,408 | 924 |
| Trinidad Central Oilfields, Ltd. | 1,812,118 | 1,557,764 | n.a. | 7,515 | 5,209 |
| Trinidad Petroleum Development Company, Ltd. | 4,444,972 | 4,147,158 | 67,310,035 | 10,565 | 8,453 |
| Total | 34,063,287 | 28,928,768 | 558,893,993 | 65,418 | 51,740 |

n.a.—not available.
[1] Formerly known as The United British Oilfields of Trinidad, Ltd.
[2] Formerly known as Trinidad Leaseholds, Ltd.
[3] Siparia prior to 1957 not available.

appraisal well to 6,010 feet. Both of these wells were abandoned.

**Refining.** The total volume of crude oil processed through the three Trinidad refineries amounted to 50,267,600 barrels, an average throughput of 138,000 barrels per day. These refineries have a combined crude charging capacity of 145,000 barrels daily. They are owned by Texaco Trinidad Inc. at Pointe-a-Pierre and Brighton; and by Shell Trinidad Ltd. at Point Fortin.

**Refining in Trinidad, 1957**

| | |
|---|---|
| Number of refineries in Trinidad | 3 |
| Crude oil charging capacity, barrels daily: | |
| 1. Texaco Trinidad Inc. | 100,000 |
| 2. Shell Trinidad Ltd. | 40,000 |
| 3. Brighton | 5,000 |
| Total capacity, barrels daily | 145,000 |
| Average throughput in 1957, barrels per day | 138,000 |

# Argentina . . . Nation hopes to have 100 rigs operating by end of 1958 in effort to determine oil potential

ARGENTINA made some tangible progress during 1957 and 1958 toward utilizing its large potential for oil and natural gas production, but much remained to be done to correct the mounting imbalance of petroleum demand over supply. Essential pipe line projects were getting under way. Some foreign financial obligations were eased. The Argentine public was becoming more oil-conscious, and it was hoped that political pressures might be reversed in favor of allowing private capital, both domestic and foreign, to do the essential job of putting the oil industry on its feet. However, no definite instances of such concessions to private interests could be cited as of midyear 1958.

**Production.** Crude oil production in 1957 rose to 33,854,583 barrels, an average of 92,752 barrels daily during the year. The 1957 daily rate represents a 7.0 percent gain as compared with 1956, when an average of 86,659 barrels was produced daily.

Yacimientos Petroliferos Fiscales (YPF), the government oil agency, boosted its production to 29,285,542 barrels, an average of 80,234 barrels daily, as compared with 71,378 barrels per day during 1956.

Diadema Argentina S A de Petroleo was again in second place to YPF in Argentina crude production in 1957, with a total yield of 2,963,697 barrels or an average of 8,120 barrels daily. This compares with 8,348 barrels daily produced by Diadema in 1956. Since the private firms operating in Argentina cannot win new concessions, all of them are undergoing gradual depletion of their oil reserves.

See Insert Map

Lesser amounts of crude were produced in 1957 by Astra Compania Argentina de Petroleo, Petroquímica, Esso S A Petrolera Argentina, and Compañía Rio Autel "El Sosneado". Three of these firms represent domestic capital; the Esso company is a Standard Oil (New Jersey) affiliate.

**Drilling.** YPF has been able to increase the number of rigs in operation from 56 at the start of 1956 to 70 early in 1958. Including several contract rigs, it hoped to have 100 in operation by the end of this year. YPF was reported to have received 20 rigs rated to about 7,000 feet during 1957, and this delivery resulted in an increase in footage drilled to about 1,728,000 feet. About 300 wells were completed last year by YPF. Diadema and Esso kept rigs active at Kilometro 27 (Comodoro Rivadavia) and at Neuquen.

Some of YPF's new rigs scheduled for late 1958 delivery were to come from Nuovo Pignone of Florence, Italy.

Laughlin-Porter Drilling Company of Midland, Texas, was readying three

**Important Exploration Outstep Wells and Deep Exploration Wells in Trinidad During 1957.**

| COMPANY | Well No. | Total Depth (Feet) | Result | Remarks |
|---|---|---|---|---|
| Apex (Trinidad) Oilfields Limited | Fyzabad 616 | 8,578 | Producer | Lower Cruse producer. |
| | 619 | 8,459 | Abandoned | Dry Hole. |
| | Cedros 2/624 | 13,045 | Abandoned | Abandoned after testing Lower Cruse sands between 11,820 and 13,010, and Morne L'Enfer sands between 3,750 and 4,390. |
| | Fyzabad 625 | 8,225 | Producer | Lower Cruse producer. |
| | 632 | 8,682 | Producer | Lower Cruse producer. |
| | 637 | 9,148 | Abandoned | Dry Hole. |
| Dominion Oil Limited | Chickland 1 | 9,056 | Abandoned | |
| | Puerto Grande 1 | 7,918 | Abandoned | |
| | Couva Marine, 1 & 1A | 7,732 | Abandoned | 7070' reported in 1957. Well completed 1958. |
| Trinidad Petroleum Development Co. Ltd. | Cedros 7 | 8,800 | Abandoned | Abandoned in Lower Cruse. |
| | Rock Dome 1 | 8,604 | Producer | Drilled to Upper Cretaceous. Producing from Herrera sands. |
| | Los Bajos 58 | 9,632 | Producer | Tested Lower Cruse. Producing from Lower Forest. |
| | Palo Seco 409 | 5,300 | Producer | Tested Lower Cruse. Producing from Middle Cruse. |
| | 416 | 4,600 | Producer | Tested Lower Cruse. Producing from Upper Cruse. |
| | 418 | 11,788 | Producer | Drilled to Karamat. Tested Lower Cruse. |
| | 419 | 4,005 | Producer | Tested Lower Cruse. Producing from Upper Cruse. |
| | Coora 243 | 6,032 | Producer | Tested Middle Cruse. Producing from Upper Cruse. |
| | 249 | 5,307 | Producer | Tested and producing from Upper Cruse. |
| | 250 | 5,900 | Abandoned | Tested and abandoned in Lower Cruse. |
| | Erin 7 | 4,500 | Producer | Tested Lower Cruse. Producing from Upper Cruse. |
| | Moruga West 54 | 2,750 | Producer | Tested and producing from Herrera Sands. |
| | Moruga East 35 | 4,386 | Producer | Tested and producing from Lower Cruse |
| | 37 | 4,505 | Producer | Drilled to Cretaceous. Completed in Forest/Cruse. |
| | 39 | 4,730 | Abandoned | Drilled to Palaeocene. Abandoned after testing Karamat. |
| | 41 | 4,000 | Producer | Tested and producing from Lower Cruse. |
| | 43 | 5,403 | Producer | Tested Lower Cruse. |
| | 48 | 4,700 | Producer | Tested Lower Cruse. |
| | 53 | 4,200 | Abandoned | Tested and abandoned in Lower Cruse. |
| Shell Trinidad Ltd. | Catshill CO-77 | 8,186 | Abandoned | Herrera sands proved to be wet. |
| | CO-77a | 8,039 | Abandoned | Deviated well from shoe of CO-77. Abandoned due to mechanical difficulties. |
| | Lizard OL-1 | 5,003 | Abandoned | Tested Miocene sands: No commercial production. |
| | Spring Penal P-233 | 10,344 | Abandoned | Abandoned Herrera sands. Poor producer in Forest sands. |
| | P-236 | 10,000 | Producer | Producing from Herrera sands. |
| | P-237 | 9,650 | Producer | Karamat/Herrera producer. |
| | Point FE-108 | 8,000 | Producer | Miocene producer. |
| Trinidad Central Oilfield Ltd. | Wilson 63 | 10,184 | Producer | Good producer. |
| | 64 | 9,418 | Producer | Plugged back to 4,000 ft. and deviated to 4,987, plugged back to 3,000 ft.—Small producer 1945 2181 ft. |
| | 65 | 7,290 | ..... | Drilling in progress—objective 10,500 ft. |

rigs for shipment to Argentina to commence a 40-well drilling contract for Tierra del Fuego, negotiated on a straight footage basis with YPF. The deal had been delayed somewhat, but work was scheduled to start in September, 1958, when spring weather begins.

YPF had discovered two oil and two gas fields in Cretaceous beds on the Argentine side of Tierra del Fuego at depths of about 6,000 feet as of midyear 1958. Development of the two oil fields was to be completed first, and if some contract footage remained, further exploratory drilling might be done. About eight structures had been located by YPF on Tierra del Fuego, four of which it considered to be proven.

**Exploration.** YPF reported about a dozen important discoveries during 1957, scattered over several of the nation's oil provinces. Four discoveries were reported in Mendoza, including Rio Tunuyan and La Ventana south of Barrancas and El Carrizal, and at Estructura Intermedia north of Refugio. At Plaza Huincul, La Borrosa, located northwest of Neuquén and due north of Challaco, came in at 2,400 barrels of oil per day, and was producing 600 barrels daily as of midyear 1958.

Another discovery was reported in the vicinity southwest of Neuquén. Other important new fields were found in Santa Cruz, Tierra del Fuego, and Chubut.

**Pipe Lines.** At midyear 1958, about 60,000 tons of 22 and 24-inch line pipe was being shipped from the U. S. for use in building the long-awaited 1,000-mile natural gas pipe line from Campo Duran field in Salta to Buenos Aires. Construction of the line, slated for 1960 completion, was approaching Tucuman by midyear 1958.

In addition, YPF was considering bids for construction of a 14-inch, 450-mile crude oil pipe line from Plaza Huincul to Puerto Rosales, near Bahia Blanca on the Atlantic Coast 350 miles southwest of Buenos Aires.

**Refining.** Argentina's 18 refineries had a combined crude charging capacity in excess of 200,000 barrels by the end of 1957. Generally, Argentine refineries were being pressed to their throughput limit, due to increased domestic demand and lack of capital to provide reserve excess capacity. Diadema modified existing installations somewhat and was running 36,300 barrels of crude daily at the end of 1957 at the Buenos Aires refinery, including crude intake at cracking plants. Diadema's distillation capacity is only 23,000 barrels per day. Esso was running a total of 40,500 barrels per average day during 1957 at its refineries located at Campana, Galvan, Elordi, and Dadin.

**Foreign exchange.** Fuels represent Argentina's largest single import item. Despite increases in production, the nation paid $270 million to import petroleum last year, compared to $206 million in 1956, as demand continued to outrun domestic supplies.

The so-called Paris Club pact was signed on Nov. 25, 1957, by which Argentina concluded multilateral trade and payments accords with 11 Western European nations. The effect of the pact is to stretch Argentina's payments on indebtedness over a longer period, so that it is not in such desperate straits to repay immediate obligations.

**Political situation.** However, much remained to be done to put Argentina's house in order financially. YPF is beset by lack of operating capital, obsolete equipment, shortages of trained technicians and inability to compete with private firms' wage scales to hold its more capable personnel. Demands for higher wages by employes tend to aggravate the financial problem.

Since the return to a democratic form of government, the country has reverted to the Constitution of 1853, which was abrogated by Peron. According to the old Constitution, oil reserves belong to the province and not to the Argentine central government. Hence, YPF must negotiate with provincial governments for the right to continue to produce oil.

**Crude Oil Production and Drilling in Argentina in 1957**

| Name of Company | Crude Oil Production in 1957, in Barrels | 1957 Crude Production in Barrels Daily | Number of Wells Completed in 1957 | Amount of Footage Drilled During 1957 |
|---|---|---|---|---|
| Yacimientos Petroliferos Fiscales (YPF) | 29,285,542 | 80,234 | 300* | 1,728,000* |
| Diadema Argentian S A de Petroleo | 2,963,697 | 8,120 | 13 | 59,584 |
| Astra Compania Argentina de Petroleo | 740,000* | 2,027 | ** | ** |
| Petroquimica | 575,000* | 1,575 | ** | ** |
| Esso S. A. Petrolera Argentina | 286,948 | 786 | 2 | 2,299 |
| Compania Rio Autel "El Sosneado" | 3,396* | 9* | ** | ** |
| Total | 33,854,583 | 92,752 | 315 | 1,789,883 |

* Estimated.
** Figure not available.

**Crude Oil Production by Yacimientos Petroliferos Fiscales (YPF) in 1957**

| Name of Province | Name of District | Crude Oil Production in 1957, in Barrels | 1957 Crude Production, in Barrels Per Day | Total Cumulative Number of Wells Completed as of December 31, 1957 | Number of Wells on Production During 1957 |
|---|---|---|---|---|---|
| Mendoza | Mendoza | 9,039,701 | 24,766 | 356 | 187 |
| Santa Cruz | Canadon Seco | 7,728,686 | 21,174 | 609 | * |
| Chubut | Comodoro Rivadavia | 7,632,421 | 20,911 | 4,118 | 2,113 |
| Neuquen | Plaza Huincul | 4,140,204 | 11,343 | 1,103 | 349 |
| Salta | Norte | 744,530 | 2,040 | 311 | 109 |
| Tierra del Fuego | Tierra del Fuego | 0 | 0 | 17 | 0 |
| Total | | 29,285,542 | 80,234 | 6,514 | 2,758 |

* Figure not available.

**Royal Dutch Shell and Standard Oil (New Jersey) Subsidiaries' Production in Argentina**

| Name of Company | Affiliation | Crude Oil Production in 1957, in Barrels | 1957 Crude Production, in Barrels Daily | Number of Wells Completed in 1957 | | | | Footage Drilled in 1957 | Number of Wells Producing at End of 1957 | | | Shut in |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Oil | Gas | Dry | Total | | Flowing | Pumping | Total | |
| Diadema Argentina S A de Petroleo | Royal Dutch Shell | 2,963,697 | 8,120 | 8 | 0 | 5 | 13 | 59,584 | 0 | 435 | 435 | 0 |
| Esso S A Petrolera Argentina | Standard Oil (N J) | 286,948 | 786 | 0 | 0 | 2 | 2 | 2,299 | 1 | 106 | 107 | 82 |
| Total | | 3,250,645 | 8,906 | 8 | 0 | 7 | 15 | 61,883 | 1 | 541 | 542 | 82 |

# Bolivia . . . Transportation problems have been eased; more attractive oil policy bolsters development

NOTWITHSTANDING the difficult economic situation of the country, oil development in Bolivia has been speeded up considerably.

The transportation difficulties of this landlocked country have been overcome in a short period.

New railways have been built to Argentina and Brazil, completing the already existing connections to Peru and Chile. The large network of pipe lines, to be connected shortly with the Pacific coast, soon should permit a rapid rise of the petroleum production.

Attractive oil legislation and the progressive oil policy of the government oil agency, Yacimientos Petroliferos Fiscales Bolivianos, have succeeded in attracting many foreign companies and considerable foreign capital.

Thus, the outlook for Bolivia's oil development, aided by favorable geological prospects, is promising.

The difficult political situation, following a social revolution and predominance of leftist labor syndicates, has been eased, and inflation has been halted. Although much must be done to restore economics and politics to normal, the success achieved so far justifies expectations of continued progress.

**Concessions.** At the end of 1957, concessions granted amounted to about 10 million acres. Another 10 million acres had been applied for. And about 4.6 million acres of concessions have been contracted for by foreign companies in the areas reserved for YPFB.

Acreage has been obtained by Bolivian Gulf Oil Company; Cia. Petrolera Shell; Andes Oil Company composed of Pure Oil Company, Standard Oil Company of Ohio and Hancock Oil Company; had Bolivian Petroleum Corporation, subsidiary of Drilling and Exploration Company; Bolivian American Oil Company, affiliated with Cuban Consolidated Petroleum Corporation, and others.

Applications have been filed for additional acreage by Bolivian Gulf, Bolivian American, Shell by Bolivian California Exploration Company (subsidiary of Standard Oil Company of California), White Eagle International Oil Company of Tulsa, and Cataract Mining Company, active in Panama.

The former McCarthy concession is located in YPFB area. It is now reduced to 900,000 acres, and has been taken over by Chaco Petroleum Company and associates. Chaco Petroleum is a subsidiary of Tennessee Gas Transmission Company.

Fish Engineering Company has been granted the Bolivian Madrejones concession of nearly 110,000 acres between the McCarthy concession and the Argentine boundary.

The Comision Mexta area, constituted in 1938 in payment for the Santa Cruz-Corumba railway, built by Brazil, has been divided by the governments of Bolivia (60 percent) and Brazil (40 percent). But the Brazilian part shall be developed only by Brazilian private interests, subject to the Bolivian petroleum law. This provision excludes the Brazilian government's oil agency, PETROBRAS.

**Air surveys.** For speeding up exploration, contracts for air surveying of some 60,000 square miles have been concluded by several oil companies with a Canadian group at a cost exceeding $500,000.

See Insert Map

**Production.** Daily average production of crude oil in Bolivia by YPFB was increased in 1957 by 1,065 barrels, or 12.2 percent, over 1956. The total output rose to 3,575,489 barrels, or 9,796 daily, in 1957 from 3,195,819 barrels, or 8,731 barrels daily, in 1956. The increase in production has been only moderate because of the lack of market outlet for more oil.

**Drilling.** The number of wells completed in Bolivia in 1957 totaled 24. That was one well or 4 percent, less than the 25 wells completed in 1956.

The amount of footage drilled was increased 12.8 percent to 121,031 feet in 1957 from 107,282 feet in 1956.

In 1957 there were 10 rotary rigs and 3 cable tool rigs active in Bolivia.

**Exploration.** On Feb. 7, 1958, Bolivian Gulf Oil Company spudded its first exploratory well at Mandeyapecu, on the Carandaiti anticline on the border of the Chaco, east of Boyuibe on the Yacuiba-Santa Cruz railway.

Chaco Petroleum Company was drilling an exploratory well on the Agua Salada structure, the continuation of Madrejones-Campo Duran in Argentina.

**Pipe line.** Construction work was started in February, 1958, on the 218 miles of pipe line from Sica-Sica, a station on the Cochabamba-La Paz pipe line, to Arica in northern Chile on the Pacific. Cost is estimated at $10½ million. Total length of the pipe line from the Camiri fields to seaport will amount to nearly 800 miles.

La Paz, terminal of the 231-mile pipe line from Cochabamba, will be connected by a pipe line with Puno in Peru, to avoid transport by rail and transshipment by steamer on Lake Titicaca.

A 4½-inch pipe line, 171 miles long, from Camiri to Santa Cruz was completed in August, 1957, and a refinery will be erected in Santa Cruz.

A 450-mile pipe line to Paraguay has been projected by a French syndicate, and construction of a 3,000 barrels per day refinery in Asuncion has been proposed.

**Refineries.** About 2.4 million barrels of crude was processed in Bolivia in 1957, an average of 6,575 barrels daily.

**Crude Oil Production and Drilling in Bolivia in 1957**

| FIELD | Crude Oil Production (Barrels) | | No. of Oil Producing Wells at End of 1957 | | | Wells Completions in 1957 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Year 1957 | Daily Average in 1957 | Flowing | Pumping | Total | Oil | Gas | Dry | Total Wells | Total Footage |
| Camiri & Guairuy | 3,111,266 | 8,524 | 58 | 8 | 66 | 14 | .. | 4 | 18 | 76,612 |
| Sanandita | 39,711 | 109 | .. | 12 | 12 | 1 | .. | .. | 1 | 5,942 |
| Bermejo and Toro | 424,512 | 1,163 | 14 | 4 | 18 | 3 | .. | 2 | 5 | 38,477 |
| Total | 3,575,489 | 9,796 | 72 | 24 | 96 | 18 | .. | 6 | 24 | 121,031 |

# Brazil . . . Crude production doubles again, following completion of Catu-Mata-Candeis pipe line

BRAZIL'S CRUDE oil production more than doubled in 1957, after having doubled also in 1956. The sharp increase in production has followed the completion of a 31-mile crude oil pipe line from Catu-Mata-Candeis. It affords market outlet for the Reconcavo Bahiano oil fields.

With benefit of the pipe line, Brazil's oil output has increased steadily from an average of 5,517 barrels per day in 1955 to averages of 11,089 barrels in 1956 and 27,688 barrels in 1957. The output has climbed steadily from 7,043 barrels daily in January, 1956, to 40,936 barrels daily in December, 1957.

**Production.** In 1957 Brazil's total production amounted to 10,106,267 barrels. That was practically as much as the country had produced in the preceding 16 years. The cumulative production up to Dec. 31, 1957, after 20 years of drilling and development, stood at 20,513,134 barrels. This oil has come from the Reconcavo Bahia area.

**Reserves.** Brazil's crude oil reserves were estimated at 821.5 million barrels as of Dec. 31, 1957. They were expanded substantially during 1957 through sharply increased drilling. Fifty oil wells were completed in 1957, compared with 32 in 1956.

The incentive for increasing Brazil's reserves and production is great, as oil demand far exceeds domestic supply. The country is consuming close to 200,000 barrels per day of petroleum products. It is importing currently some 150,000 barrels daily.

**Exploration.** For 1958, a vast exploratory program has been scheduled by Petroleo Brasileiro, S. A., the official oil agency in Brazil. The budget for the year is over $200 million, compared with some $150 million in 1957.

See Insert Map

This budget will cover in part surface geology work of 156 party months, gravimetry and magnetometer of 120 party months, and seismograph a total of 192 party months.

Of the 97 wells to be drilled, 29 wildcats are scheduled in the Amazon region, 8 wildcats in the Maranhao area, 12 in the Bahia-Sergipe-Alagoas (Atlantic seaboard) area, 31 in the Reconcavo Bahia area, and 14 wells in the southern Parna area.

In late 1957, an important oil strike was reported by Petrobras in its wildcat Ja-1-Al on the Atlantic coast in the Alagoas area. The well was drilled to 7,277 feet. It tested some 35 barrels per hour or 840 barrels per day of 40-gravity oil, on a ¼-inch coke. The oil pool is near large consuming centers and strategically located.

**Refining.** Brazil has seven refineries, with combined crude charging capacity of 87,100 barrels daily.

### Drilling in Brazil, Year 1957, by Areas

| Geographic Area | Wells Spudded | WELLS COMPLETED | | | | Exploratory Footage | Stratigraphic Footage | Field Footage | Total Footage Year 1957 |
|---|---|---|---|---|---|---|---|---|---|
| | | Oil | Gas | Dry | Total | | | | |
| 1. Amazonas | 10 | 1 | 0 | 7 | 8 | 45,052.4 | 19,549.9 | 0 | ..... |
| 2. Marnahao Basin | 6 | 0 | 0 | 5 | 5 | 29,365.0 | 8,100.7 | 0 | ..... |
| 3. Alagoas-Sergipe | 4 | 2 | 0 | 1 | 3 | 22,825.6 | 0 | 0 | ..... |
| 4. Reconcavo (field) | 75 | 46 | 2 | 22 | 70 | 37,889.6 | 19,344.2 | 207,667.3 | ..... |
| 5. Parana | 5 | 0 | 0 | 3 | 3 | 12,762.1 | 9,678.9 | ..... | ..... |
| Total | 100 | 49 | 2 | 38 | 89 | 147,894.7 | 56,673.7 | 207,667.3 | 412,235.7 |

### Brazil Oil and Gas Production, by Fields

| FIELD | 1957 Oil Output, Barrels | Barrels Oil Production, Cumulative to December 31,1957 | Oil Reserves December 31, 1957 Million Barrels | GAS OUTPUT IN 1957 | | |
|---|---|---|---|---|---|---|
| | | | | Million Cubic Meters | Million Cubic Feet, Total | Thousand Cubic Feet, Daily |
| 1. Dom Joao | 974,285 | 2,825,092 | 393 | 3.0 | 106 | 291 |
| 2. Candeias | 2,780,024 | 8,905,080 | 126 | 18.9 | 667 | 1,827 |
| 3. Agua Grande | 5,673,694 | 7,258,339 | 265 | 59.0 | 2,084 | 5,710 |
| 4. Mata de S. Joao | 658,314 | 910,580 | 18 | 22.2 | 784 | 2,148 |
| 5. Pojuca | 16,056 | 19,126 | 10.5 | 0.3 | 11 | 30 |
| 6. Itaparica | 3,827 | 313,145 | 6 | 1.0 | 36 | 99 |
| 7. Pedras | 0 | 125 | 2 | 0 | 0 | 0 |
| 8. Paramirin | 0 | 139,421 | 1 | 0 | 0 | 0 |
| 9. Aratu | ..... | 57,222 | .... | 54.0 | 1,907 | 5,224 |
| 10. Pitanga | ..... | 411 | .... | 0 | 0 | 0 |
| 11. Sao Pedro | Gas Field | 0 | .... | 0.0 | 0.0 | 0.0 |
| 12. Lobato | 67 | 84,593 | .... | 0 | 0 | 0 |
| Total | 10,106,267 | 20,513,134 | 821.5 | 158.5* | 5,595 | 15,329 |

* 158.5 million cu. meters of gas = x 35.3 = 5.6 billion cu. ft. of natural gas. = 15 million cu. ft./Day.

### Brazil Crude Oil Production and Drilling in 1957, by Months

| 1957 By Month | Barrels Crude Oil Production | Barrels Per Day | Wells Spudded in | WELLS COMPLETED | | | | | | Wells Completed, Cumulative | | RIGS ACTIVE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Oil | Gas | Dry | Stratigraphic | Total | Footage (Feet) | Oil | Gas | Exploration | Field | Total |
| January | 787,883 | 25,416 | 6 | 5 | 0 | 2 | 0 | 7 | 26,595.9 | 333 | 35 | 13 | 5 | 18 |
| February | 702,860 | 25,102 | 8 | 6 | 1 | 5 | 1 | 13 | 22,038.5 | 339 | 36 | 13 | 3 | 16 |
| March | 738,200 | 23,813 | 9 | 2 | 0 | 3 | 0 | 5 | 38,542.3 | 341 | 36 | 10 | 10 | 20 |
| April | 605,863 | 20,195 | 5 | 4 | 0 | 4 | 0 | 8 | 28,269.0 | 345 | 36 | 11 | 7 | 18 |
| May | 558,290 | 18,009 | 10 | 2 | 0 | 1 | 0 | 3 | 36,589.4 | 347 | 38 | 14 | 11 | 25 |
| June | 710,181 | 23,673 | 6 | 3 | 0 | 0 | 0 | 3 | 30,108.5 | 350 | 36 | 17 | 11 | 28 |
| July | 825,218 | 26,620 | 3 | 4 | 0 | 1 | 0 | 5 | 25,861.3 | 354 | 36 | 19 | 7 | 26 |
| August | 930,354 | 30,011 | 9 | 5 | 0 | 1 | 1 | 7 | 40,271.9 | 359 | 37 | 14 | 13 | 27 |
| September | 881,458 | 29,382 | 11 | 4 | 1 | 5 | 0 | 10 | 36,738.6 | 368 | 38 | 13 | 16 | 29 |
| October | 956,837 | 30,866 | 11 | 7 | 0 | 2 | 1 | 10 | 40,520.1 | 377 | 39 | 11 | 19 | 30 |
| November | 1,140,083 | 38,002 | .. | 3 | 0 | 5 | .. | 8 | 46,036.0 | 380 | 39 | 18 | 14 | 32 |
| December | 1,269,040 | 40,936 | .. | 5 | 0 | 6 | .. | 11 | 37,643.1 | 385 | 39 | 16 | 14 | 30 |
| Total 1957 | 10,106,267 | 27,688 | .. | 50 | 2 | 35 | 3 | 90 | 409,214.6 | 385 | 39 | 16 | 14 | 30 |
| Total, 1956 | 4,058,704 | 11,089 | 53 | 32 | 1 | 12 | .. | 45 | 229,466.6 | 328 | 35 | 13 | 6 | 19 |

**Note:** Number of oil wells producing on December 31, 1957, was 174, yielding an average of 174 barrels daily per well.

# Chile . . . ENAP still in control; new oil law stymied by political unrest

OIL DEVELOPMENT in Chile has remained limited to that of the government-owned Empress Nacional del Petroleo ("ENAP"). There has been further discussion of a new petroleum law which would permit development by private companies, including foreign. But action on such a measure has been delayed by the unsteady political situation, new elections to Congress in March, 1957, and intense campaigning for the new presidential elections to be held in September, 1958.

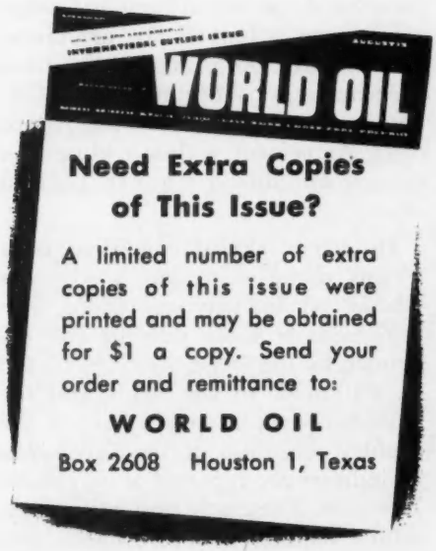
There has been no further action, likewise, on a proposed amendment of the original bill. Under the amendment, private companies already established in Chile would be permitted to operate in the Magellan region, the only prospective area in Chile so far.

Future oil legislation will depend largely on the presidential elections of 1958. Because of the difficult economic situation and advancing inflation, the more moderate parties of the center have lost influence. Decisions will be made mainly between the rightist parties, which favor a free economy, and the extremely leftist parties, which if victorious will further tighten government controls and nationalization.

Development of the Chilean oil industry has been proceeding. Drilling and production have been continued on Tierra del Fuego, below the Strait of Magellan. Exploration has been extended also to the main land, including a region in northern Chile.

ENAP succeeded in expanding Chile's crude oil production to an average of 11,882 barrels daily in 1957. That was an increase of 22 percent over the 9,678 barrels daily produced in 1956. The agency plans to double the capacity of the national Concon refinery to 44,000 barrels daily. It also proposes to complete in 1958 a products pipe line from Concon refinery to Santiago for supplying central Chile.

**Exploration.** Four new oil discoveries have been reported in the Magellan fields, at Gaviota, Tres Lagos, Lautaro and Albatros.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**Production.** Crude oil output rose 22 percent in 1957 to 4,336,784 barrels or 11,882 barrels daily, from 3,542,031 barrels or 9,678 barrels daily in 1956. Production has increased further in 1958 to about 13,000 barrels daily. The most important production was supplied by the Cullen pool in the eastern part of the Magellan fields. It was discovered only three years ago and now is yielding almost one third of the total Chilean output. It averaged 3,906 barrels daily in 1957.

**Drilling.** In 1957 in Chile 68 wells were completed, compared with 63 in 1956. Of the 68 wells, 26 yielded oil, 10 gas and 32 were dry. Of the total, 35 were development wells, 16 extension wells and 17 were exploration wells. Of the exploration tests, 3 yielded oil, 2 gas and 12 were dry.

Up to Dec. 31, 1957, a total of 351 wells had been drilled in Magellanes, of which 138 yielded oil, 61 gas, and 152 were dry.

At the end of the year 77 wells

**Crude Oil Production in Chile in 1957, by Fields**

| FIELD | Barrels | Barrels Daily |
|---|---|---|
| Manantiales | 52,467 | 144 |
| Sombrero | 991,362 | 2,716 |
| Victoria | 769,005 | 2,107 |
| Chanarcillo | 268,135 | 735 |
| Chillan | 508,438 | 1,393 |
| Cullen | 1,425,603 | 3,906 |
| Vertientes | 92,281 | 252 |
| Flamenco | 124,831 | 342 |
| Others | 104,691 | 287 |
| Total, Chile | 4,336,813 | 11,882 |

Note: This table was prepared by converting officially reported cubic meters to barrels on the basis of one cubic meter equaling 6.2898 barrels. The conversion process accounts for the slight difference in Chile's production by fields as shown here and by months as shown in another table.

**Chile Crude Oil Production and Drilling, by Months**

| MONTH | Crude Oil Production (Barrels) | Barrels Per Day | Number of Fields Producing | WELLS COMPLETED | | | | | WELLS PRODUCING | | | RIGS ACTIVE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Oil | Gas | Dry | Total | Footage | Flowing | Artificial Lift G/L | Total | Exploration | Field |
| **1957:** | | | | | | | | | | | | | |
| January | 332,718 | 10,733 | 17 | 0 | 2 | 2 | 4 | 38,376 | 55 | 6 | 61 | 3 | 2 |
| February | 303,634 | 10,844 | 17 | 0 | 2 | 3 | 5 | 37,825 | 59 | 6 | 65 | 3 | 1 |
| March | 339,724 | 10,959 | 17 | 1 | 0 | 3 | 4 | 38,138 | 56 | 6 | 62 | 3 | 2 |
| April | 336,529 | 11,218 | 17 | 1 | 0 | 5 | 6 | 42,233 | 58 | 6 | 64 | 2 | 2 |
| May | 350,490 | 11,306 | 15 | 3 | 0 | 3 | 6 | 30,760 | 55 | 6 | 61 | 1 | 2 |
| June | 348,987 | 11,633 | 16 | 1 | 1 | 0 | 2 | 35,707 | 53 | 6 | 59 | 1 | 4 |
| July | 366,447 | 11,821 | 16 | 1 | 2 | 2 | 5 | 35,212 | 57 | 6 | 63 | 1 | 4 |
| August | 369,183 | 11,909 | 14 | 2 | 1 | 2 | 5 | 42,149 | 56 | 6 | 62 | 1 | 4 |
| September | 367,758 | 12,259 | 17 | 3 | 1 | 4 | 8 | 47,972 | 63 | 6 | 69 | 1 | 5 |
| October | 403,183 | 13,006 | 17 | 6 | 0 | 2 | 8 | 50,670 | 64 | 6 | 70 | 2 | 3 |
| November | 393,445 | 13,115 | 17 | 4 | 0 | 4 | 8 | 37,959 | 65 | 6 | 71 | 3 | 2 |
| December | 424,686 | 13,700 | 19 | 2 | 2 | 2 | 6 | 50,301 | 71 | 6 | 77 | 3 | 2 |
| Total 1957 | 4,336,784 | 11,882 | 19 | 24 | 11 | 32 | 67 | 487,302 | 71 | 6 | 77 | 3 | 2 |
| Total 1956: | 3,542,032 | 9,678 | 16 | 18 | 16 | 29 | 63 | 410,242 | 52 | 6 | 58 | 1 | 0 |
| **1958:** | | | | | | | | | | | | | |
| January | 444,070 | 14,424 | 19 | 2 | 1 | 4 | 7 | 32,242 | 71 | 7 | 78 | 1 | 3 |
| February | 404,202 | 14,436 | 19 | 0 | 2 | 6 | 8 | 48,537 | 75 | 7 | 82 | 3 | 1 |
| March | 451,703 | 14,571 | 20 | 5 | 1 | 1 | 7 | 51,654 | 80 | 7 | 87 | 2 | 2 |

were producing, of which 71 were flowing and 6 pumping.

Total footage drilled in 1957 amounted to 487,302 feet compared with 410,252 feet in the previous year, an increase of 19 percent. Average depth of the wells was 7,166 feet, against 6,410 feet in the preceding year. That was an increase of nearly 12 percent in the drilling depth.

**Pipe Lines.** About 60 miles of new pipe lines were completed in 1957 in the Magellan fields. They now comprise a total of nearly 200 miles. The 8-inch line from Chilean pool to Bahia San Felipe was put in operation.

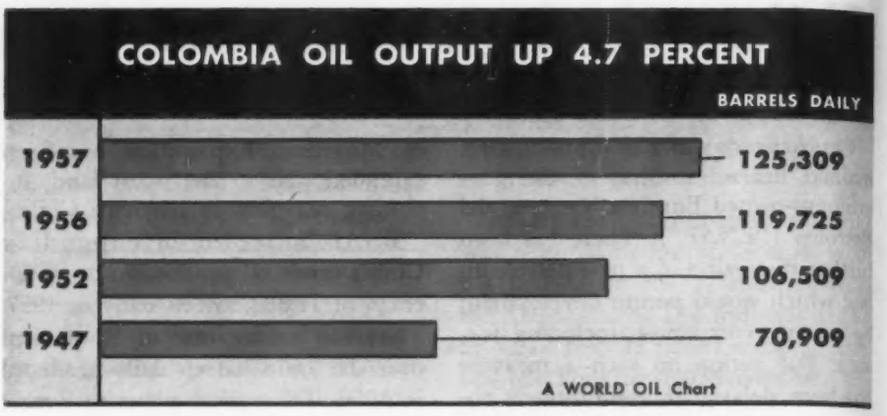
In June, 1957, a new national company, SONACOL, was established by ENAP, the national distributing firm Compania de Petroleos de Chile COPEC, and Esso Standard Oil Company of Chile, for the construction and operation of a 73-mile, 10-inch products pipe line from Concon refinery to Santiago, to be completed in 1958.

Crude oil run to stills at Concon in 1957 totaled 7,021,933 barrels, an average of 19,238 barrels daily. The runs included 3,738,072 barrels, or 10,241 barrels daily, of crude from Magellanes, and 3,283,861 barrels total or 8,997 barrels daily, from Venezuela.

During the year 4,092,597 barrels of crude, an average of 11,213 barrels daily, were shipped in total from Magellanes to Concon refinery, and 365,909 barrels or 1,002 barrels daily, were exported to Uruguay.

**Repressuring.** The Manantiales plant in Magellanes has been increased in capacity. In 1957 a total of 3,995,690 barrels, or a daily average of 1,095 barrels, of crude was treated for stabilization, and 476,300,000 cubic meters of wet gas was treated. Following production of propane, butane, natural gasoline, gasoline, kerosine and diesel oil, 62,977,000 cubic meters of gas was reinjected for repressuring.

Other repressuring plants are located at Sars for Chanarcillo, Sombrero, and Victoria fields and in Flamenco and Calafate.




# Colombia . . . Exploration spreads to Caribbean coast; crude production moves up to 125,309 barrels daily, an increase of 4.7 percent from 1956

COLOMBIA'S OIL development is expected to continue its steady, gradual progress. A friendly attitude to foreign capital and a fair oil law are favorable features. Adjustments that have been made in connection with dollar-peso exchange henceforth will reduce costs. Agreement within a bipartisan government should smooth political unrest.

However, natural conditions offer serious obstacles to any spectacular rise in oil industry operations. Development is made difficult and expensive by the large distances of 300 to 400 miles to the fields and the mountainous physiography of the country. Earnings of the Colombian oil industry are reported at only about 7 percent. The costly exploration constantly requires new investments and new supplies of foreign capital, estimated at some $20 million yearly.

Almost all of Colombia's production still comes from the middle and upper Magdalena valley fields and the Barco concession. Exploration of the Sinu-Bolivar basin and the Caribbean coast is particularly interesting because of their more favorable geographic location.

**Production.** Colombia's crude oil production in 1957 totaled 45,737,786 barrels, an average of 125,309 barrels daily. That was an increase of 4.7 percent over the output of 119,725 barrels daily in 1956. Production was up slightly farther to 126,258 barrels daily in March 1958.

There were declines in the two oldest fields, Empresa Colombiana's De Mares concession and Colombian Petroleum Company's Barco concession. But those declines were offset by higher production elsewhere. Texas Petroleum Company showed an increase, particularly from its new Palagua field. It increased from less than 100,000 barrels in 1956 to nearly 2 million barrels in 1957. The new

See Insert Map

Cicuco field near the Caribbean coast, discovered only in 1956 by Mobil Oil, yielded over 500,000 barrels in 1957.

Secondary recovery by water-flooding was successfully started in the De Mares concession by Forrest Oil Company.

Decline of Shell's principal and oldest Casabe field of around 1 million barrels was offset by the increase of the San Pablo field, which yielded nearly 1 million barrels more. International's small Totumal and Agua Chica fields together decreased from around 210,000 barrels to only 110,000 barrels.

**Exploration.** Exploratory activity has been very active and has spread to the Caribbean coast. Drilling was started by new companies, such as Sun Oil Company, associated with Pure Oil and United Carbon Company; An Son Petroleum Company of Oklahoma; and Ambassador Oil Company of Dallas. Wildcatting has started in the Llanos region, east of the Cor-

dilleras and within the Amazon basin. In 1957, a total of 26 exploratory wells were completed, of which 7 struck oil and 19 were dry.

In the Cicuco field in the lower Magdalena, discovered in 1956, eight wells have been drilled so far by Colombian Petroleum Company. Output in 1957 rose to 511,845 barrels. Reserves are estimated at 50 million barrels.

Exploration has been particularly active in the Sinu basin. Colombian Delta Petroleum Company took over the Floresanto concession and drilled two dry wildcats to 1,169 and 2,700-foot depths and withdrew. Ambassador Oil Company is working in the Floresanto region. Colombian Sun Oil Company drilled its La Mora well near the Sinu coast. Nearby, Mobil Oil drilled its wildcat, Cordoba 1. But both were abandoned in May, 1958, as dry.

In the middle Magdalena region, Shell Oil Company made important discoveries at Las Garzas, where No. 1 yielded 380 barrels daily, and at Peñas Blancas, located on its Yondo concession. Texas Petroleum struck oil in the Sogamoso field with a well yielding 325 barrels daily. Cities Service, drilling with a 75-25 share with Empresa in the Cararé area, drilled its first well, Chucur 1, which struck oil at 7,746 feet and hit basement at 10,733 feet. Cities Service also is drillon the Santa Clara structure.

In the Lebrija field, discovered by Mobil, An Son Petroleum Company completed a well yielding 150 barrels daily.

In the upper Magdalena valley, production of Palaguas field of Texas Petroleum Company, a northern extension of Velasquez field, started only in 1956, rose from 95,626 barrels in that year to 1,964,961 barrels in 1957. The new Ermitaño field, east of Palagua, yielded nearly 80,000 barrels. International Petroleum Company of Colombia struck oil at Gualanday, north of Texas' Tetuan field, Well 3 yielding some 200 barrels daily at 7,922 feet.

In the Llanos region a test of International near the Venezuelan boundary struck basement at 3,071 feet and was abandoned.

**Drilling.** Wells completed in 1957 totaled 156, compared with 138 in 1956, and included 128 oil wells and 28 dry holes. Total footage amounted to 1,013,131 feet, against 815,479 feet in 1956. Average depth of the wells amounted to 6,494 feet. Twenty rigs were active, on average, not including service rigs.

At the end of the year, 1,990 wells were producing. They were yielding an average of 63 barrels daily per well.

Crude oil reserves of Colombia are estimated around 700 million barrels.

**Concessions.** Areas under concession now comprise about 60 million acres. International is the largest holder, with about 40 percent of the total. Concessions and applications cover the Magdalena valley up to points south of Neiva, the Barco concession and its surroundings, almost the entire Sinu-Bolivar basin of the lower Sinu and Magdalena rivers from the Caribbean coast to about 8 degrees northern latitude, and the Llanos basin or the northern Llanos area to the border of the Guyana shield near the Meta River.

John W. Mecom, of Houston, who had acquired concessions on the Caribbean coast and started surveys, withdrew from the country.

**Refining.** An outstanding event in refining was the inauguration on Dec. 7, 1957, of the Cartagena refinery of International Petroleum Company on the Caribbean coast. It has a capacity of 27,500 barrels daily. It was built at a cost exceeding $30 million. The plant is expected to free the country definitely from imports.

Colombia's refining capacity of about 70,000 barrels daily considerably exceeds the domestic demand. Refineries include the Barranca Bermeja refinery of 37,500 barrels per day capacity of Empresa Colombiana, operated also by International; the local plant at Tibu in the Barco concession; the Dorado refinery in the upper Magdalena valley; and the small Guamo topping plant of Texas Petroleum Company in its Tetuan field.

Colombia's runs to stills in 1957 amounted to 18,376,296 barrels, an average of 50,346 barrels daily, although Cartagena went on stream only in December.

Crude oil exports in 1957 amounted to 29,964,332 barrels, an average of 82,094 barrels daily, and had a value of $72.3 million.

## Drilling in Colombia in 1957, by Companies

| COMPANY | WELLS COMPLETED IN 1957 | | | | | Wells Completed in 1956 | Footage Drilled in 1956 |
|---|---|---|---|---|---|---|---|
| | Oil | Gas | Dry | Total | Footage | | |
| Shell Condor S. A. | 36 | 0 | 2 | 38 | 238,274 | 22 | 119,606 |
| Empresa Colombiana de Petroleos | 16 | 0 | 2 | 18 | 82,026 | 24 | 89,250 |
| Colombian Petroleum Company | 26 | 0 | 1 | 27 | 236,459 | 40 | 244,988 |
| Texas Petroleum Company | 48 | 0 | 4 | 52 | 322,707 | 42 | 284,901 |
| International Petroleum Company | 2 | 0 | 7 | 9 | 78,660 | 8 | 63,540 |
| Richmond Oil Company | 0 | 0 | 6 | 6 | 30,193 | 1 | 7,217 |
| Mobil Oil Company | 0 | 0 | 3 | 3 | 10,500 | 1 | 5,977 |
| Delta Petroleum Company | 0 | 0 | 2 | 2 | 4,369 | 0 | 0 |
| Colombian Cities Service Pet. | 0 | 0 | 0 | 0 | 3,443 | 0 | 0 |
| An-Son Petroleum Company | 0 | 0 | 1 | 1 | 6,500 | 0 | 0 |
| Total | 128 | 0 | 28 | 156 | 1,013,131 | 138 | 815,479 |

## Crude Oil Production in Colombia in 1957 and 1956, by Companies and Fields

| COMPANY AND FIELD | Year 1957 (Barrels) | Daily 1957 (Barrels) | Producing Wells End of 1957 | Year 1956 (Barrels) | Daily 1956 (Barrels) | Cumulative Through 1957(Bbls.) |
|---|---|---|---|---|---|---|
| **Shell Condor S. A.** | **14,811,842** | **40,580** | **418** | **14,839,544** | **40,545** | **141,163,772 (Shell)** |
| Casabe | 11,083,698 | 30,366 | 387 | 12,064,158 | 32,962 | 123,922,291 |
| Cantagallo | 928,193 | 2,543 | 10 | 882,747 | 2,412 | 6,096,581 |
| San Pablo | 2,338,275 | 6,406 | 7 | 1,360,309 | 3,717 | 4,220,652 |
| Dificil | 461,676 | 1,265 | 14 | 532,330 | 1,454 | 6,924,248 |
| **Empresa Colombiana de Petroleos:** | | | | | | |
| De Mares | 10,383,114 | 28,447 | 1,131 | 10,747,950 | 29,366 | 486,467,830 |
| **Colombian Petroleum Company:** | **9,834,266** | **26,943** | **316** | **9,427,456** | **25,758** | **132,736,245** |
| Barco | 9,322,421 | 25,541 | 310 | 9,427,456 | 25,758 | 132,224,400 |
| Cicuco | 511,845 | 1,402 | 6 | 0 | 0 | 511,845 |
| **Texas Petroleum Company:** | **10,582,723** | **28,994** | **121** | **8,593,993** | **23,481** | **29,138,239** |
| Velasquez | 8,125,756 | 22,262 | 78 | 8,069,945 | 22,049 | 25,293,499 |
| Palagua | 1,964,961 | 5,384 | 35 | 95,626 | 261 | 2,048,171 |
| Ortega | 394,688 | 1,081 | 3 | 402,557 | 1,100 | 1,486,285 |
| Tetuan | 30,534 | 84 | 1 | 25,865 | 71 | 243,500 |
| Caipal | 13,084 | 36 | 1 | 0 | 0 | 13,084 |
| Ermitano | 53,700 | 147 | 3 | 0 | 0 | 53,700 |
| **International Petroleum Company** | **125,841** | **344** | **6** | **210,553** | **575** | **649,643** |
| Buturama | 53,218 | 146 | 2 | 118,256 | 323 | 391,534 |
| Totumal | 57,422 | 157 | 3 | 92,297 | 252 | 242,908 |
| Gualanday | 15,201 | 41 | 1 | 0 | 0 | 15,201 |
| Total | 45,737,786 | 125,309 | 1,992 | 43,819,496 | 119,725 | 790,155,729 |

# Ecuador . . .

## Tax problem continues

DRILLING ACTIVITY was virtually shut down in Ecuador at midyear 1958 because of failure of the government to allow operating companies any price or tax relief on oil products. It was expected that, as a result, a small number of well completions would occur in 1958 as compared with previous years.

Data on Ecuador operations, where there are only two operators active, shows a substantial drop for 1957 compared to 1956. Oil output dropped 532 barrels daily, or 5.7 percent, to the 1957 average of 8,742 barrels daily. Drilling was reduced from eight rigs to three at the end of December, 1957, with 82,433 feet less footage drilled for the year.

See Insert Map

Land holding in Ecuador total 34.3 million acres. That is as much as in Peru, more than in Venezuela and in Colombia. Actually some 24.7 million acres of the Leonard concession must be discounted—the area once held by Standard Oil Company (N. J.) and Shell, and where some $40 million were spent in exploration and surrendered.

Manabi Exploration Company, one of the two oil operators in Ecuador, reports that its drilling activities have been suspended indefinitely as a result of a labor situation, which precipitated a wildcat strike of two months duration early last September.

**Exploration.** No exploratory discoveries were made during 1957. But encouraging shows were found by California Ecuador Petroleum Company, Standard Oil Company of California, subsidiary, in 1 Santo Domingo wildcat. Manabi Exploration Company, owned 50.5 percent by Pantepec Oil Company, drilled an exploratory well of interest at Manta 4, the first outside the Santa Elena peninsula since 1947, but no shows were reported.

About 10 miles west of California Ecuador's wildcat, West Pacific Petroleum Company, subsidiary of Israel Mediterranean Petroleum Inc. and Pan-Israel Oil Company Inc., has taken a concession. Several companies have offshore rights, and California Ecuador was conducting offshore seismic work on its area. Anglo Ecuadorian was conducting directional drilling from the shore of its Ancon concession, which extends 1.5 miles out to sea and 45 miles along the coast.

**Drilling and Production in Ecuador in 1957, by Months**

| 1957 by Month | Barrels Crude Oil Production | Barrels Per Day | WELLS COMPLETED | | | | Footage | RIGS ACTIVE | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total | | Field | Wildcat |
| January | 265,715 | 8,571 | 7 | 0 | 2 | 9 | 21,998 | 8 | 1 |
| February | 238,777 | 8,528 | 7 | 0 | 1 | 8 | 14,328 | 5 | 3 |
| March | 250,456 | 8,079 | 3 | 0 | 0 | 3 | 16,328 | 3 | 1 |
| April | 231,556 | 7,719 | 2 | 0 | 2 | 4 | 11,498 | 2 | 4 |
| May | 264,581 | 8,535 | 5 | 0 | 1 | 6 | 21,378 | 6 | 2 |
| June | 266,386 | 8,880 | 4 | 0 | 0 | 4 | 20,915 | 4 | 0 |
| July | 286,769 | 9,559 | 9 | 0 | 2 | 11 | 18,513 | 5 | 0 |
| August | 295,379 | 9,528 | 7 | 1 | 1 | 9 | 20,162 | 5 | 1 |
| September | 242,122 | 8,071 | 4 | 0 | 1 | 5 | 12,841 | 3 | 1 |
| October | 283,969 | 9,160 | 4 | 1 | 1 | 6 | 17,085 | 4 | 1 |
| November | 275,344 | 9,178 | 6 | 0 | 0 | 6 | 16,953 | 3 | 1 |
| December | 289,715 | 9,346 | 3 | 0 | 0 | 3 | 13,134 | 2 | 1 |
| 1957 Total | 3,190,769 | 8,742 | 61 | 2 | 11 | 74 | 205,133 | 2 | 1 |
| 1956 Total | 3,394,261 | 9,274 | 140 | 1 | 19 | 160 | 287,566 | 7 | 1 |

# Paraguay . . . Pure Oil now drilling; Brazilian company committed to exploration under new concession

PARAGUAY again is the scene of oil leasing activities. Several operators have acquired prospective oil areas for exploration and development. Some 10 years ago, Union Oil Company of California obtained a large concession to wildcat in the Chaco region, drilled five wells, and abandoned the efforts.

**Pure Now Drilling.** During the past 12 months, Pure Oil Company of Paraguay, together with Williams Brothers Company, obtained a concession covering some (14,826,000 acres). The life of this concession agreement extends over a period of 14 years. The operators are committed to the drilling of two wells, with a total of 16,000 foot depths and to drill each well so that it will pass through the Devonian formation.

Pure Oil Co. of Paraguay Inc. will be the operator of this concession.

Pure and Williams Brothers recently revealed that they will share the concession in Paraguay with three associates. These are: Gulf Oil Corp., Sinclair Oil and Gas Co. and Tidewater Oil Co. Pure started drilling in early July, 1958, after completion of a 120-mile road to the first well site, in the Chaco.

**Brazilian Company.** The government of Paraguay has signed a concession contract with the Brazilian firm, Petrolera Guarani, which is a subsidiary of Fiduciaria Fluminense of Rio de Janerio, Brazil. Under the contract, the Brazilian firm is committed to invest $3 million in exploration over the next three years.

Rimrock Tidelands Inc. of Box 7095, Shreveport, La., is another concessionaire in Paraguay, and California Exploration Co., an affiliate of Standard Oil Company of California, also is interested in prospective oil land in Paraguay.

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# Peru . . . Crude exports are decreasing as demand widens; production up to an average of 52,662 barrels daily

FUTURE PETROLEUM development in Peru is expected to include a gradual increase of production in the coastal fields. Lobitos fields, especially, are due to be operated more actively. International Petroleum Company acquired a 50 percent interest in those fields, and it has operated them since the end of May, 1957, gradually increasing their production.

Undeveloped prospects still remain on the coastal strip north of Lobitos. They are held by Petrolera Amotape. It will reactivate drilling there this year.

Eastern Peru's Montaña is considered as a long range prospect.

**Price problem.** Low ceiling prices on domestic products is an adverse factor. Those products require about 70 percent of the crude oil output. The price for ordinary motor gasoline at the plant is only 5 cents, U. S., per gallon, at present exchange rates. Taxes have been increased recently by about 1½ cents a gallon. The present price including all taxes amounts to 10 cents, U. S., at the filling stations in Lima. But no price increase has been granted so far to the producer and marketer. The new raise of the gasoline taxes resulted in social unrest and riots, because of increasing the cost of living and adding to inflation.

In past years, the low level of domestic prices was counter-balanced by exports. But with domestic consumption growing rapidly, while domestic crude production increases relatively little, Peru has fewer petroleum products for export each year. In the last 20 years Peruvian oil consumption increased almost 400 percent, while domestic production rose only 10 percent. International Petroleum, Peru's largest operator, sent 76 percent of its crude oil production into the export market in 1937. But in 1957 its product exports represented only 23 percent of its crude output. The time when domestic consumption will overtake domestic production is fast approaching.

With the domestic market unprofitable, and with profitable exports declining, oil company profits in Peru will continue to deteriorate if the domestic price situation is not corrected. In these circumstances, oil companies say they cannot continue the investment and expenditure programs they have been following. They feel, however, that the long range interests of the companies and of Peru coincide, and they hope the problem eventually can be resolved.

**Production.** Crude oil production in Peru increased in 1957 to 19,221,512 barrels, an average of 52,662 barrels daily. The daily output was up 4.8 percent over the 50,227 barrels of 1956. The increase reflected somewhat greater output of the Lobitos fields, a rise to 2,718 barrels daily in 1957 from 2,026 daily in 1956 for Empresa Petrolera Fiscal, and a virtual doubling of production of Compañia Petroleo Ganzo Azul, now has stabilized its output at an average of about 2,500 barrels daily.

Output of International Petroleum Company was increased in 1957 to 12,867,710 barrels of crude, an average of 35,254 barrels daily, including its 50 percent share of the Lobitos fields. Production of Brea-Pariñas field alone declined slightly to 10,302,028 barrels, an average of 28,225 barrels daily.

Production of the Lobitos fields, including the share delivered to International, rose to 6,909,285 barrels, or 18,929 barrels daily, an increase of 5.5 percent. For Compañia Petrolera Lobitos there remained 4,343,603 barrels, or 11,900 barrels daily.

Production of Petrolera Peruana from its Mirador pool, south of International's field, declined around 18 percent to 153,137 barrels, or 420 barrels daily.

Empresa Petrolera Fiscal's output was increased to nearly a million barrels, or to 2,718 barrels daily from 2,026 daily in 1956, an increase of 34.2 percent.

**Oil Producing Wells in Peru**
**(End of 1957)**

| COMPANY | Flowing | Artificial Lift | Total |
|---|---|---|---|
| International Petroleum Co. in Brea-Parinas field | 184 | 1722 | 1906 |
| Cia. Petrolera Lobitos and International Pet. Co. (50-50 joint interests) in Lobitos field | 99 | 984 | 1083 |
| Empresa Petrolera Fiscal | 19 | 146 | 165 |
| Cia. Petroleo Ganso Azul | 16 | .... | 16 |
| Petrolera Peruana | 7 | .... | 7 |
| Peruvian Pacific Petroleum Co. | .... | 2 | 2 |
| Douglas Oil Company | .... | 1 | 1 |
| Petrolera Amotape | .... | 2 | 2 |
| El Oriente Co. | 3 | .... | Shut in |
| Total | 328 | 2857 | 3185 |

**Drilling.** The number of wells completed in Peru dropped sharply to 151 in 1957 from 200 in 1956, a 24.5 percent decline. Wildcatting in the Sechura desert ceased completely, and only a few wildcats were completed in other areas. Drilling was restricted principally to development and extension of existing fields.

On the continental shelf, Peruvian Pacific Petroleum Company, a subsidiary of Cities Service Company and Richfield Oil Corporation, proposed the drilling of three offshore wells, starting in September, 1958..

Petrolera Amotape, an independent, announced plans to drill 10 new wells, beginning in June, 1958, north of Lobitos.

**Amazon Basin.** In eastern Peru's Montaña in the Amazon Basin, Compañia Petroleo Ganso Azul did not continue further drilling in 1957. It previously had completed 20 wells on its concession. The company is producing from its 16 successful wells 2,000 to 3,000 barrels daily. It is shipping 1,500 barrels daily to the Manaos refinery in Brazil. The remainder of production supplies the government's refinery in Iquitos and local consumption.

El Oriente Company has drilled seven wells on the Maquia structure, the last having been completed in April, 1958. The first three wells yielded 500 barrels per day each of 38-gravity crude from the Upper Cretaceous "sugar sandstone" at depths of about 2,100 to 2,200 feet. Wells 4 and 5, on the western flank, did not prove commercial. Well 6, located between 1 and 5, high on the structure, reportedly yielded about 500 barrels daily. Well 7, to the east, was reported to yield in tests about 40 barrels per day.

**Geophysical work.** Geophysical surveys have been reactivated in the Ucayali Basin by Geophysical Service, Inc., operating for Mobil Oil Company and two other companies, associated for this purpose.

Peruvian Pacific Petroleum Company in early 1958 completed an airborne magnetometer survey of its concessions in the Amazon Basin.

Cerro de Pasco Petroleum Company was continuing geological surveys by William Ross Cabeen Inc., of Los Angeles, in the southern Ucayali Basin, particularly on the Iscozazin anticline.

See Insert Map

**Refineries.** The 45,000 barrels per day refinery of International Petroleum Company at Talara was providing about 98 percent of Peru's demand for petroleum products. Runs to stills in 1957 amounted to 15,522,-531 barrels, an average of 42,527 barrels daily.

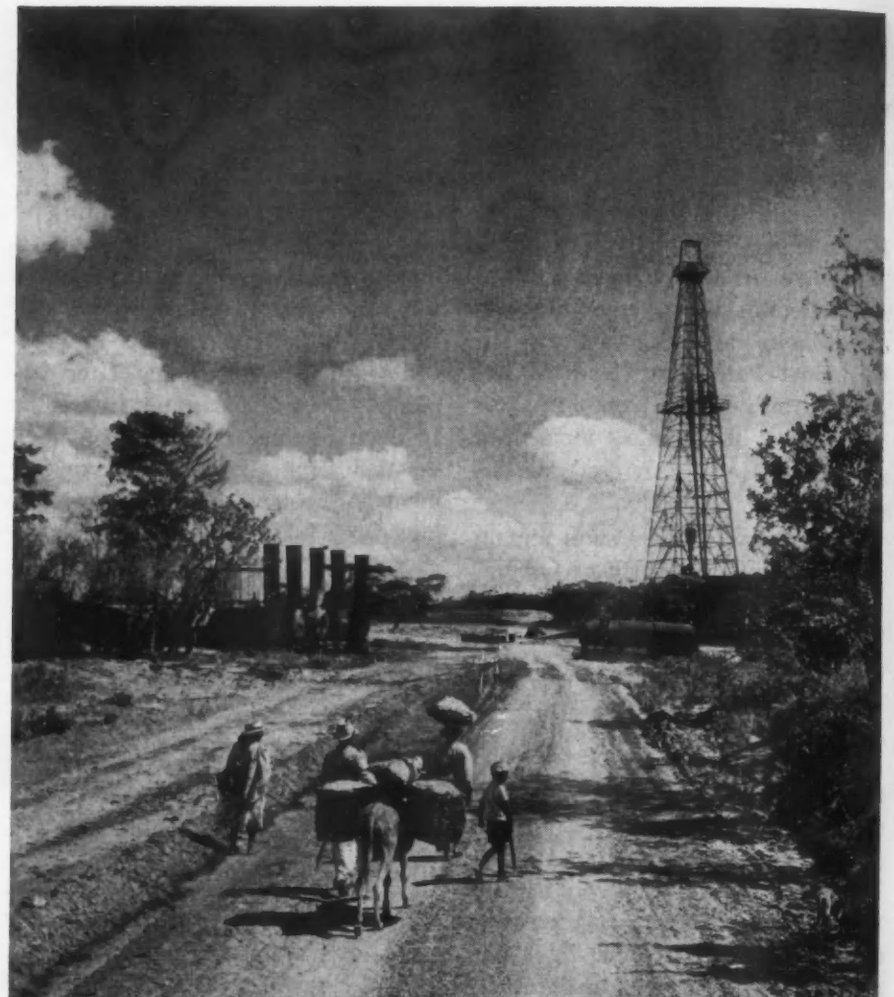
Domestic demand of Peru in 1957 totaled 14,823,533 barrels, an increase of 7.2 percent, and an average of 40,612 barrels daily.

# Uruguay . . .

## Russian oil bought

URUGUAY has no indigenous oil production. It imports crude and refined products through the state oil agency Administracion Nacional de Combustibles Alcohol y Portland, which operates the only refinery in the country. The Montevideo plant now processes 28,000 barrels daily. Late in 1957 a contract was signed for the enlargement of the refinery.

ANCAP is a buyer of crude and products. Crude has been obtained from Venezuela, Trinidad and Middle East. Last year 8 million barrels of crude was imported and 2.3 million barrels of oil products. A recent trade agreement with Russia, calls for a trial shipment of about 140,000 barrels of crude from Russia, and, if satisfactory, further purchases during 1958 most likely will be made. This may involve for the first shipment around $\$1/2$ million.



This Venezuelan Petroleum Company well in Monagas was drilling in early 1958.

# Venezuela . . . Drilling, production, new discoveries highlight year of marked developments

THE YEAR 1957 was a period of great activity for the Venezuela oil industry. Production rose sharply to new all-time rates during the Suez Canal crisis, then slackened during the latter part of the year. A series of spectacular new oil discoveries were made in Lake Maracaibo, most of them on new concessions granted in 1956. The Barinas basin acquired its first outlet for previously shut-in crude oil sources. Drilling rose to a high in 1957. More major discoveries dotted the center of Lake Maracaibo in the first half of 1958, and the first oil discovery on Venezuela's side of the Gulf of Paria near Trinidad apparently had been made by midyear 1958.

See Insert Map

**Concessions.** From July 4, 1956, to Aug. 1, 1957, 89 new concessions were granted to private firms, many of them entering Venezuela for the first time. The new grants amounted to 2,029,426 acres. A complete summary of these concessions was published in WORLD OIL, August 15, 1957, Page 132.

A total of 16,534,069 acres was under concession in Venezuela at the

end of 1957, of which 1,261,075 acres, or 7.6 percent, were exploration concessions and 15,272,994 acres (92.4 percent) were development concessions. The total area represented an 8.4 percent increase over the corresponding figure for the end of 1956.

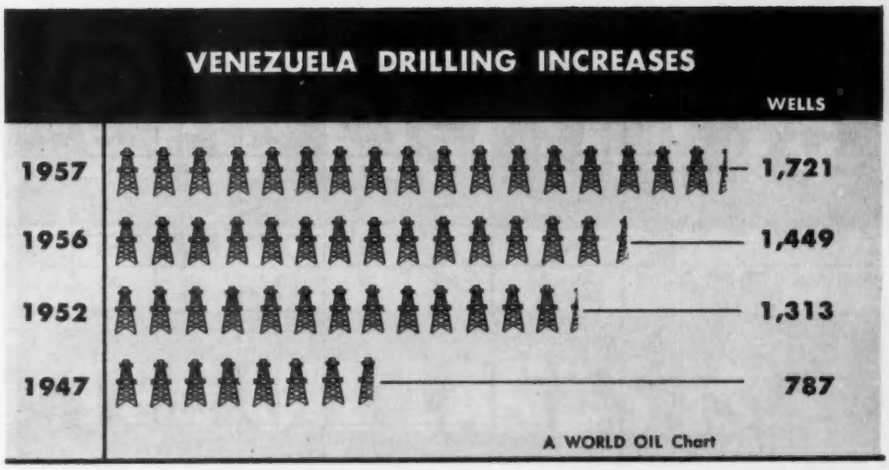
New concessions granted during 1957 included 491,795 acres for development for which the recipients paid a total of $299,625,441.00 or an average of $609.25 per acre. Also, 791,585 acres in new exploration concessions brought $42,927,255.00 in bonuses, for an average of $54.23 per acre.

About 7.3 percent of Venezuelan territory and 16.7 percent of the total national area estimated to have oil possibilities was covered by concessions at the end of 1957. As to distribution, 43.6 percent of the total concessions area at the end of 1957 was in western Venezuela. The remaining 56.4 percent was in eastern Venezuela.

**Drilling.** During 1957, a total of 1,746 wells were completed in Venezuela, including 1,574 oil wells, 9 gas wells, 138 dry holes, 11 gas injection wells, 12 water injection and two LPG injection wells. Also, 112 wells were suspended last year, and two were re-drilled. Compared with the 1,449 completions during 1956, last year's total was up 297 wells, or 20.5 percent.

It was the second year in a row in which the increase exceeded 20 percent of the previous year's completions. However, only 327 completions were recorded during the first quarter of 1958, and only about 1,400 completions were expected this year. Depending on many factors, 1958 completions could run as high as 1,500 or as low as 1,200. But the concensus was that they would not only drop below 1957's record, but also below the 1,449 figure of 1956.

A total of 11,118,441 feet was drilled in Venezuela in 1957, representing an increase of 1,523,834 feet, or 15.9 percent, from the 9,594,607 feet recorded for 1956. Primary emphasis during 1957 was on development wells. A total of 137 wildcats were completed, as compared with 138 in 1956 and 171 in 1955.




**Discoveries on New Concessions.** A series of prolific new oil discoveries on new acreage in Lake Maracaibo began in 1957 with a major discovery by Superior Oil Company on its Lama block, located about 25 miles west of the eastern shore of Lake Maracaibo, southwest of Lagunillas and due west of Bachaquero field.

Superior's wells generally were being dually completed for a total of about 10,000 barrels daily from two basal Eocene zones, at about 9,100 feet and 9,500 feet. Venezuelan Sun Oil Company, operating for itself and also for Venezuelan Atlantic Refining Company (VARCO) and Seaboard Oil Company, reported 1,250 feet of net oil sand in SVS 12, located in the same area. Unquestionably, a major discovery has been made here. Creole Petroleum Corporation and Mene Grande Oil Company were completing producers in the new field in 1958, in addition to Superior and Sun. Some of Superior's wells were on production in 1958.

The new area appeared to be a continuation of the Tia Juana trend, and it was not known how far south in Lake Maracaibo it would continue.

Signal Exploration Company (affiliate of Signal Oil and Gas), operating for itself and Hancock Oil Company, Standard Oil Company of Ohio, and Pure Oil Company, completed an oil discovery at Centro 2X on block 4 in Lake Maracaibo in 1957, about 13 miles southeast of the Superior discovery. Centro 4X was completed in 1958 flowing 4,510 barrels of 32.4-gravity oil per day from 11,405-11,537 feet, in Eocene.

**More Pay Zones.** Three other good pay zones found in the well indicated a gross potential of 17,000 barrels daily. Still farther south in the Lake, Creole completed a good well at CL-6, located about nine miles south of Signal's new production and 22 miles southwest of Bachaquero field, for 5,000 barrels daily. San Jacinto Petroleum Company was trying to extend this production even farther south, near the southernmost edge of the new concessions area, early in 1958.

San Jacinto and Mene Grande completed oil producers in National Reserve acreage in Lake Maracaibo south of Bachaquero.

Paria Operations, Inc., had found oil at Posa 1, the first well to be drilled on the new 152,004-acre concession block owned by The Texas Company (operator for the group), Continental Oil Company, The Ohio Oil Company, Richfield Oil Company and Cities Service Company. The first test was spudded last October, and had drilled below 11,000 feet at the end of the year. A drill-stem test below 4,000 feet recovered substantial amounts of oil. Four drilling platforms were in place as of early 1958 on the acreage block.

Spurred on by the discovery, Paria Operations was evaluating the concession rapidly. Paria's discovery is near the Trinidad boundary in the Gulf of Paria. It is the first offshore discovery on the Venezuela side.

In the Maracaibo district, reserves also were augmented in 1957 by extensions and/or new pays in Tia Juana, Lagunillas, Bachaquero and Urdaneta; and in Compania Shell de

## Venezuela Drilling Activity in 1957 by Company and District

| COMPANY | District | COMPLETED WELLS | | | | PRODUCERS COMPLETED | | | | Dry Holes | Drilling as of 12-31-57 | Wells Suspended During 1957 | Wells Recompleted |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Exploitation | Semi-Wildcats | Wildcats | Total | Exploitation | Semi-Wildcats | Wildcats | Total | | | | |
| Creole | Maracaibo | 145 | 20 | 13 | 178 | 131 | 13 | 9 | 153 | 11 | 10 | 23 | .. |
| | Barcelona | 35 | 62 | 9 | 106 | 34 | 56 | 5 | 95 | 10 | 4 | 6 | .. |
| | Maturín | 24 | 9 | 16 | 49 | 24 | 7 | 3 | 34 | 15 | 9 | 5 | .. |
| | Barinas | .... | ... | ... | .... | .... | ... | .. | .... | ... | 1 | ... | .. |
| | | 204 | 91 | 38 | 333 | 189 | 76 | 17 | 282 | 36 | 24 | 34 | .. |
| Shell | Maracaibo | 555 | 25 | 2 | 582 | 548 | 23 | 1 | 572 | 6 | 26 | 5 | .. |
| | Barcelona | .... | ... | 6 | 6 | .... | ... | 2 | 2 | 4 | 2 | 1 | .. |
| | Maturín | 8 | ... | ... | 8 | 8 | ... | .. | 8 | ... | ... | ... | .. |
| | | 563 | 25 | 8 | 596 | 556 | 23 | 3 | 582 | 10 | 28 | 6 | .. |
| Mene Grande | Maracaibo | 23 | 5 | 1 | 29 | 23 | 5 | 1 | 29 | ... | 5 | 5 | .. |
| | Barcelona | 111 | 147 | 16 | 274 | 102 | 141 | 13 | 256 | 13 | 19 | 8 | .. |
| | Maturín | 18 | 24 | 2 | 44 | 16 | 18 | .. | 34 | 10 | 2 | 2 | .. |
| | | 152 | 176 | 19 | 347 | 141 | 164 | 14 | 319 | 23 | 26 | 15 | .. |
| Texas | Maracaibo | 12 | 1 | 2 | 15 | 9 | 1 | 1 | 11 | 4 | 1 | 1 | .. |
| | Barcelona | 24 | 3 | 15 | 42 | 21 | 3 | 9 | 33 | 9 | 8 | 1 | .. |
| | Maturín | 4 | ... | 1 | 5 | 4 | ... | ... | 4 | 1 | ... | ... | .. |
| | | 40 | 4 | 18 | 62 | 34 | 4 | 10 | 48 | 14 | 9 | 2 | .. |
| Sinclair | Barceloa | 4 | 1 | ... | 5 | 3 | ... | .. | 3 | 2 | 1 | ... | .. |
| | Maturín | 10 | ... | 1 | 11 | 9 | ... | 1 | 10 | 1 | 2 | ... | .. |
| | Barinas | 15 | 2 | ... | 17 | 14 | 2 | .. | 16 | 1 | 1 | ... | .. |
| | | 29 | 3 | 1 | 33 | 26 | 2 | 1 | 29 | 4 | 4 | ... | .. |
| Petmer | Barcelona | 39 | 8 | 19 | 66 | 27 | 7 | 8 | 42 | 23 | 1 | 3 | 1 |
| | Maturín | 20 | ... | 7 | 27 | 20 | ... | 2 | 22 | 5 | 2 | 2 | .. |
| | | 59 | 8 | 26 | 93 | 47 | 7 | 10 | 64 | 28 | 3 | 5 | 1 |
| Varco | Barcelona | 12 | 8 | 1 | 21 | 12 | 7 | 1 | 20 | 1 | ... | 1 | .. |
| | Maturín | 28 | 7 | 2 | 37 | 26 | 7 | .. | 33 | 4 | 2 | 2 | .. |
| | | 40 | 15 | 3 | 58 | 38 | 14 | 1 | 53 | 5 | 2 | 3 | .. |
| Socony | Barcelona | 59 | 37 | 5 | 101 | 56 | 32 | 5 | 93 | 8 | 14 | 4 | .. |
| | Barinas | 10 | 4 | 2 | 16 | 10 | 3 | 1 | 14 | 2 | 2 | 1 | .. |
| | | 69 | 41 | 7 | 117 | 66 | 35 | 6 | 107 | 10 | 16 | 5 | .. |
| Phillips | Barcelona | 3 | ... | 1 | 4 | 3 | ... | .. | 3 | 1 | 1 | ... | 1 |
| | Maracaibo | .... | ... | ... | .... | .... | ... | .. | .... | ... | 2 | ... | .. |
| | | 3 | ... | 1 | 4 | 3 | ... | .. | 3 | 1 | 3 | ... | .. |
| Richmond | Maracaibo | 41 | 8 | 2 | 51 | 41 | 8 | .. | 49 | 2 | 4 | 2 | .. |
| Talon | Maracaibo | 1 | 26 | ... | 27 | 1 | 24 | .. | 25 | 2 | 5 | 33 | .. |
| Colon | Maracaibo | 11 | ... | 2 | 13 | 11 | ... | 2 | 13 | ... | 10 | 3 | .. |
| San Jacinto | Maracaibo | .... | ... | 1 | 1 | .... | ... | 1 | 1 | ... | 2 | ... | .. |
| Superior | Maracaibo | .... | ... | 5 | 5 | .... | ... | 5 | 5 | ... | 2 | ... | .. |
| Signal | Maracaibo | .... | ... | 1 | 1 | .... | ... | 1 | 1 | ... | 1 | 1 | .. |
| Venez. Amer. | Maracaibo | .... | ... | ... | .... | .... | ... | .. | .... | ... | ... | 1 | .. |
| Venez. Sun | Maracaibo | .... | ... | 1 | 1 | .... | ... | 1 | 1 | ... | 3 | 1 | .. |
| Seaboard | Maturín | .... | ... | 3 | 3 | .... | ... | 1 | 1 | 2 | ... | ... | .. |
| Pan Venezuelan | Maracaibo | .... | ... | 1 | 1 | .... | ... | .. | .... | 1 | 2 | 1 | .. |
| Continental | Maturín | .... | ... | ... | .... | .... | ... | .. | .... | ... | 1 | ... | .. |
| Total | ..... | 1,212 | 397 | 137 | 1,746* | 1,153 | 357 | 73 | 1,583 | 138 | 145 | 112 | 2 |
| Maracaibo District | | 788 | 85 | 30 | 903 | 764 | 74 | 22 | 860 | 25 | 71 | 75 | .. |
| Barcelona District | | 287 | 266 | 72 | 625 | 258 | 246 | 43 | 547 | 71 | 50 | 24 | 2 |
| Maturín District | | 112 | 40 | 33 | 185 | 107 | 32 | 7 | 146 | 39 | 20 | 12 | .. |
| Barinas District | | 25 | 6 | 2 | 33 | 24 | 5 | 1 | 30 | 3 | 4 | 1 | .. |

*Includes 11 gas injection wells, 12 water injection wells, and 2 LPG injection wells.

## Crude Oil Production in 1957 in Venezuela, by Companies

(Barrels)

| NAME OF COMPANY | Year 1957 | Daily 1957 | Daily 1956 | Percent Change |
|---|---|---|---|---|
| Creole Petroleum Corporation | 419,184,866 | 1,148,452 | 1,083,721 | + 6.0 |
| Compania Shell de Venezuela | 310,834,871 | 851,602 | 692,129 | + 23.0 |
| Mene Grande Oil Company | 147,524,227 | 404,176 | 364,658 | + 10.8 |
| Socony Mobil Oil Company | 42,239,963 | 115,726 | 97,157 | + 19.1 |
| Richmond Exploration Company | 33,587,846 | 92,021 | 61,742 | + 49.0 |
| Texas Petroleum Company | 16,517,487 | 45,253 | 47,097 | — 3.9 |
| Sinclair Oil and Refining Company | 10,716,203 | 29,359 | 29,066 | + 1.0 |
| S. A. Petrolera Las Mercedes | 10,351,709 | 28,361 | 24,105 | + 17.7 |
| Venezuelan Atlantic Refining Company | 9,079,955 | 24,877 | 20,064 | + 24.0 |
| Colon Development Company Limited* | 8,146,813 | 22,320 | 20,062 | + 11.3 |
| Phillips Petroleum Company | 5,101,531 | 13,977 | 11,073 | + 26.3 |
| Talon Petroleum Company | 785,489 | 2,152 | 2,730 | — 21.2 |
| Superior Oil Company | 253,731 | 695 | 0 | ..... |
| Coro Petroleum Company | 77,088 | 211 | 70 | +201.4 |
| Venezuelan Sun Oil Company | 12,146 | 33 | 0 | ..... |
| Caracas Petroleum Company | 8,906 | 24 | 102 | — 76.5 |
| Seaboard Oil Company | 1,623 | 4 | 0 | ..... |
| Pantepec Oil Company | 0 | 0 | 4,913 | —100.0 |
| Total | 1,014,424,454 | 2,779,245 | 2,458,689 | + 13.0 |

* In certain other charts and tables published in WORLD OIL, statistics for Colon Development Co., Ltd., a subsidiary of Canadian Shell Ltd. are included in those listed for Compania Shell de Venezuela, another member of the Royal Dutch Shell group. Colon's crude production was running at about 22,000 barrels daily as of mid-1958.

Venezuela's blocks 1, 2, and 3 in Lake Maracaibo. An important new oil discovery was made in concessions V-574 and V-575 (Mene Grande).

Several fields were significantly extended in Barcelona district, including Melones, Muestra, Mecha, Miga, Meon and Merma in the Merey area; Zulus and Zarza fields in the Zeta area; Saman field in the Soto area; and Orla and Osario fields in the Oficina area. In addition, important discoveries extensions were made in Ceibita, Mata, Nipa and Oscurote fields.

In Maturin, wells Cachipo 2 and 3 found new production in the Cara-

pita formation in the Quiriquire area. An important oil discovery was made in the Pedernales area by Seaboard Oil Company Capure 2-A. Other important extensions were made in the Quiriquire, Aguasay, Caro, Jobo, Orocual and Santa Barbara field areas.

**Crude Oil Production.** Crude production soared to a total of 1,014,424,454 barrels during 1957, the first time in Venezuela's history that it exceeded a billion barrels. The average daily rate of 2,779,245 barrels represented a 13 percent increase over the 1956 daily rate. Production grew steadily during the first half of 1957 due to emergency shipments to Western Europe to a peak of 2,968,618 barrels during June, tapering off thereafter to 2,541,884 barrels per day in December.

Creole maintained its leadership among Venezuelan crude producers, raising its production to an average of 1,148,452 barrels per day, representing a 6 percent boost above the 1956 rate and aggregating a total of 419,184,866 barrels during 1957. Compañía Shell de Venezuela made a strong gain of 23 percent above the 1956 rate, raising daily production to an average of 851,602 barrels during 1957. Virtually all producing companies in Venezuela showed strong upward surges in their crude production rates, and Sun and Superior entered the crude production picture for the first time.

San Silvestre, Silvan, Palmita and Sinco oil fields in the Barinas-Apure Basin went on production for the first time with the opening of the new pipe line in November. Barinas crude oil production was reported holding up well (about 75,000 barrels daily) in midyear 1958.

**Reserves.** Despite record withdrawals, reserves increased to an all-time peak of 15,347 million barrels at the end of 1957. This was an increase of 1,352 million barrels over the previous year's estimates, or 9.7 percent more than the December, 1956, reserves figure. It was clear from the major new discoveries being made and developed in Lake Maracaibo that another significant increase in Venezuelan reserves estimates could be expected in the near future.

Natural gas reserves were put at 30,093,783 MMcf as of the end of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1957, representing a gross increase of 4,018,282 MMcf during 1957. The net increase, after deducting production, was 3,144,448 MMcf. The ratio of production to gas reserves was 2.9 percent, and, in the case of crude, 6.6 percent.

**Crude Oil Pipe Lines.** Socony Mobil Oil Company of Venezuela began operating its 212-mile, 20-inch crude oil pipe line from Silvestre station in the Barinas basin to El Palito, seven miles west of Puerto Cabello on the Caribbean Sea in November, 1957. The initial design capacity was 100,000 barrels per day.

Socony has 75 percent initial equity in the line, with Sinclair Oil and Refining Company (name changed to Sinclair Venezuelan Oil Company as of March, 1958) holding 25 percent. Sinclair has the option of buying an additional 25 percent equity in the new line.

Initially, about 50,000 barrels daily were expected to be moved through the line, depending on crude yield from Sinclair's and Socony's wells in the Barinas basin.

In July, 1957, Venezuelan Petroleum Company (Sinclair Venezuelan) opened an 8-inch, 32-mile crude pipeline from Aguasay field in eastern Venezuela to the Amana line. Aguasay production then was raised to 4,250 barrels daily because of the new pipe line outlet.

Late in 1957, Creole commenced construction of a 90-mile, 30-inch pipe line in eastern Venezuela to provide an outlet for viscous Temblador area crudes. The new line to Caripito was nearing completion by midyear 1958. It would have a capacity of 300,000 to 500,000 barrels daily, depending on the viscosity of the crudes moved.

Vigorous pipeline construction continued in the Lake Maracaibo area. Compañía Shell de Venezuela was building an extensive new pipe line system along the east shore of the Lake and a large terminal for shipment of crude oil at Puerto Miranda, north of Altagracia near the entrance to the outer Maracaibo ship channel. The principal trunk crude collecting system is a 30-inch heated line starting at Bachaquero field, passing through Lagunillas and Cabimas. There will be two trunk lines leading from Cabimas to Puerto Miranda of 34- and 30-inch diameters, respectively. The design capacity of the Bachaquero-Cabimas line is 400,000 barrels daily, and from Cabimas to Puerto Miranda, 800,000 barrels daily.

**New Gas Pipe Lines.** Compañía Shell de Venezuela completed its 177-mile, 20-inch natural gas line from La Paz west of the Maracaibo Strait to the Cardon refinery in 1957. The line was capable of delivering between 53 and 106 MMcf daily to Cardon, where gas was being used as fuel.

By midyear 1958, Petrogas, S A. was building a 200-mile, 26-inch pipe line to move natural gas from the Anaco-area oil fields in eastern Venezuela to Caracas. The line was crossing some rugged country near Caracas.

By midyear 1958 Creole was ready to begin building an underwater gathering system for natural gas in Lake Maracaibo. The system was to include 18 separate lines, comprising 2 miles of 16-inch, 8½ miles of 30-inch, and 11 miles of 40-inch pipe. A large pipe laying barge was on its way to Lake Maracaibo early in 1958 to begin work.

**Exports.** During 1957, Venezuela exported 940,311,149 barrels of crude oil and refined products, representing an 11.1 percent increase as compared with the 1956 total of 846,221,088 barrels. The 1957 total for refined products exported was 181,536,497 barrels, a boost of 6.2 percent as compared to the 170,951,122 barrels of refined products exported in 1956.

Thus, crude oil exports were increasing faster than refined products. This is a natural trend inasmuch as refining capacity is expanding in many consumer nations which prefer to buy crude and refine it themselves rather than to import the more expensive products.

Much of Venezuela's crude output finds a market in the U. S., either as crude or as products via refineries in Venezuela and on various islands in the Caribbean. Venezuelan oil is exported to more than 45 nations.

**Refining.** Average refinery runs amounted to 688,548 barrels daily during 1957, representing a 10.1 percent increase compared with the previous year. In 1957, Venezuelan re-

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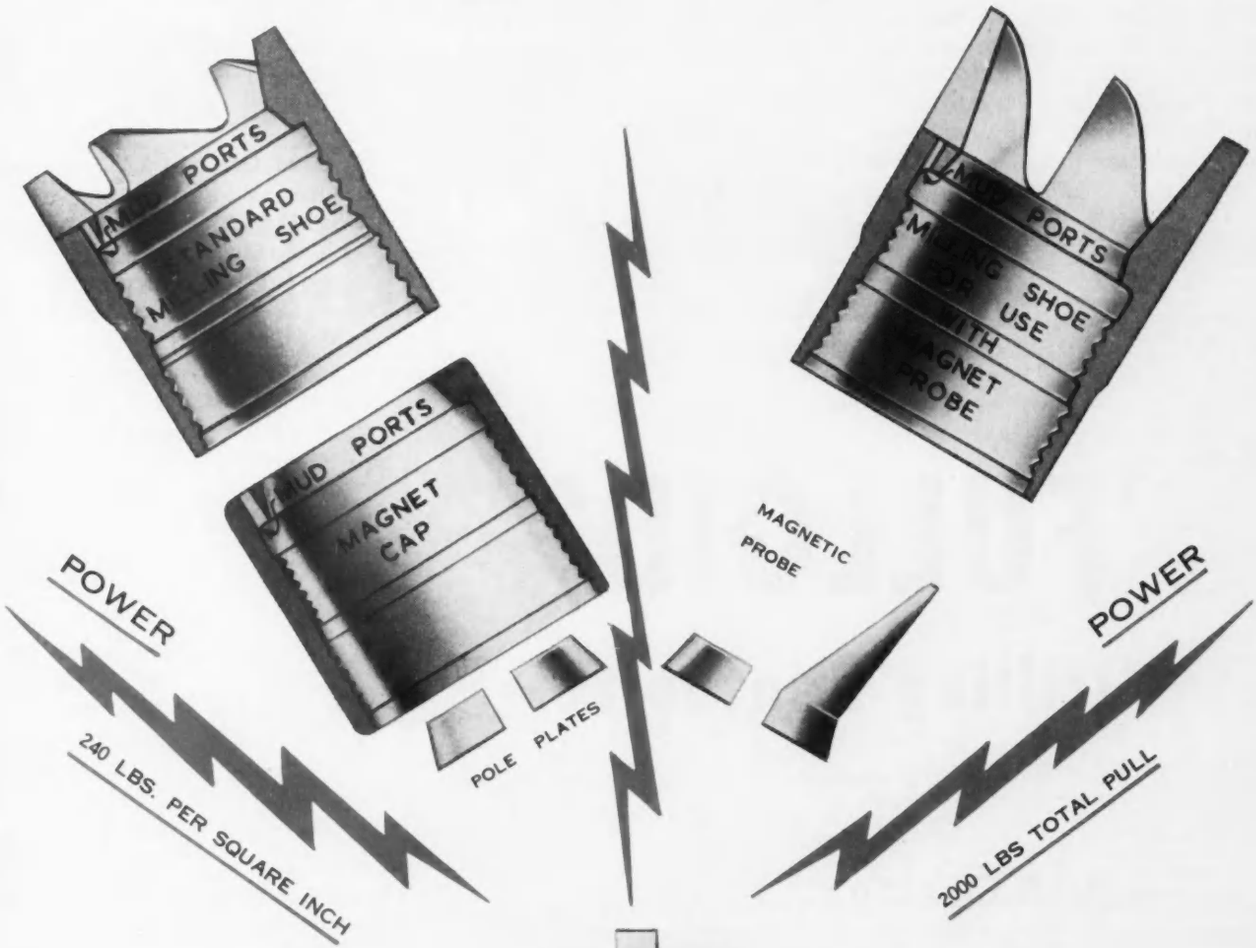


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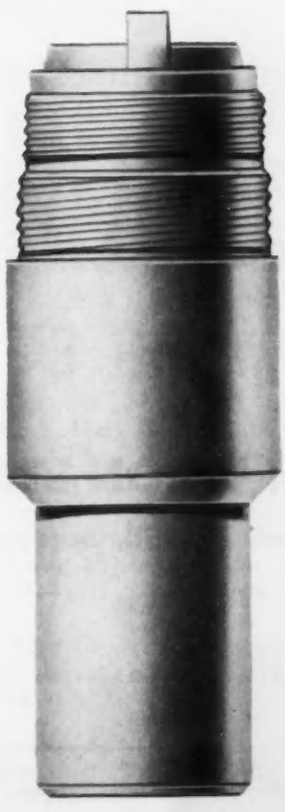

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fineries charged 24.8 percent of the indigenous crude production, representing a slight drop from the corresponding 25.4 percent posted in 1956.

Compañía Shell de Venezuela built an 80,000 barrels daily crude distillation unit at Cardon last year. Shell was running 177,400 barrels daily at Cardon at the end of the year, including crude charged in cracking plants.

At Amuay, Creole completed a new 104,000 barrels daily crude distillation unit, the fourth such unit to be built there, raising capacity to 328,000 barrels per day. Bachaquero crude was to be run in the new unit.

Socony Mobil announced that it would build a $28 million, 40,000 barrels daily refinery at El Palito, at the terminus of the Barinas pipe line. The new plant was scheduled for late 1959 completion.

Late in 1957, the Venezuelan government's $335 million project for chemical plants at Moron on the north coast was well underway. The new provisional junta government was expected to continue the project.

A noteworthy event was the first shipment of LPG exported from Creole's La Salina dock in May, 1958. It was produced at Creole's new LPG plant in Bolvar district. Mene Grande also was planning to produce LPG at Santa Rosa in eastern Venezuela and move it via pipe line to Puerto La Cruz for export.

**Taxes.** The Venezuelan government reported payment of $1,164,690,518.00 in taxes by the oil industry in 1957.

**Natural Gas.** In 1957, natural gas production rose to a total of 1,134,596 MMcf, for a daily average of 3,108 MMcf per day. This represented a 16.2 percent increase as compared to 1956, when 2,673 MMcf daily was produced. The boost was attributed entirely to increased crude oil production. The gas was disposed of as follows in the approximate amounts indicated:

- 7.8 percent, or 242 MMcf daily, burned as fuel
- 3.5 percent, or 108 MMcf daily, sold
- 23.0 percent, or 714 MMcf daily, returned to oil reservoirs for pressure maintenance purposes
- 1.3 percent, or 40 MMcf daily, recovered as liquids in natural gasoline plants
- 64.4 percent, or about 2,003 MMcf daily, vented to the atmosphere. However, utilization of natural gas was increasing rapidly, from 29.7 percent in 1956 to 35.6 percent in 1957.

During 1957, Creole completed its second large gas injection plant in Lake Maracaibo, Tia Juana 2, located seven miles offshore in the Lake and six miles south of Plant No. 1. Tia Juana 2 is designed to inject 300 MMcf of gas daily. The plant is expected to assist greatly in Creole's program to conserve and increase ultimate recovery of oil and gas. Four reservoirs in the LL-453 area are being served by the new plant (See WORLD OIL, August 1, 1957, Page 132). Creole was building Tia Juana 3 in the Lake, and expected to have it in operation by the end of 1958.

In addition, Mene Grande built a gas plant at Limon field to inject about 15 MMcf daily; and plants with smaller capacities were completed at Oscurote Norte, Mata Grande, Mata and Mapiri fields. At the end of the year, 30 gas injection


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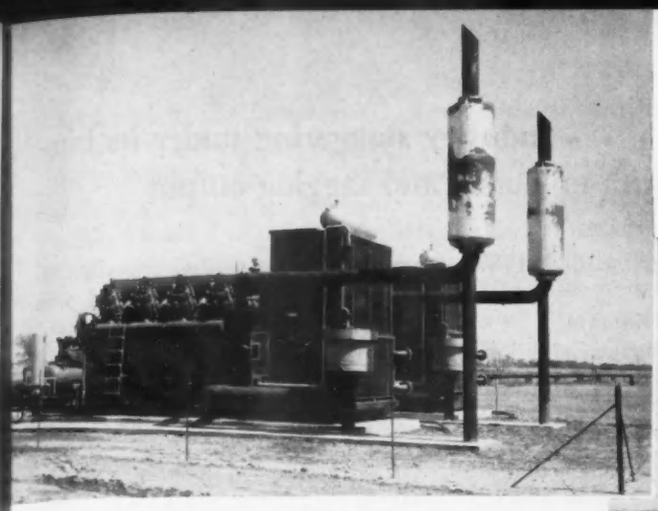

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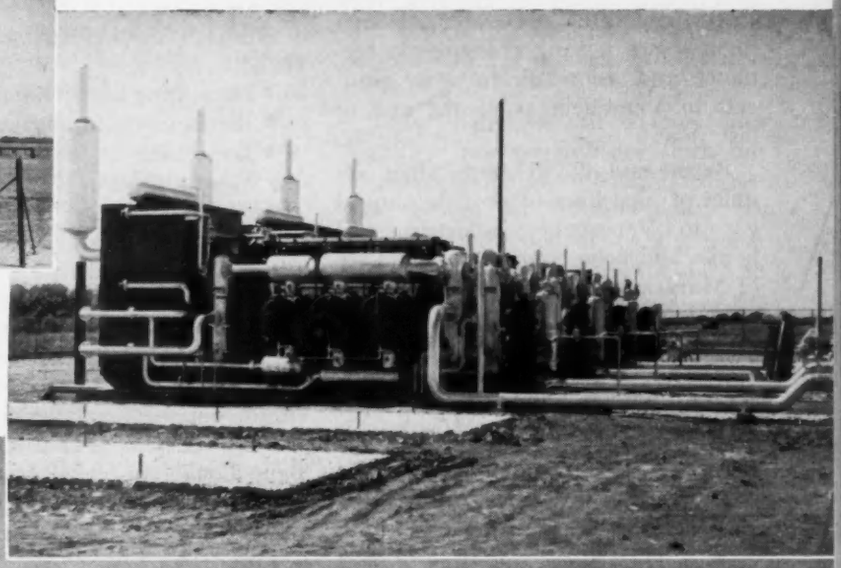

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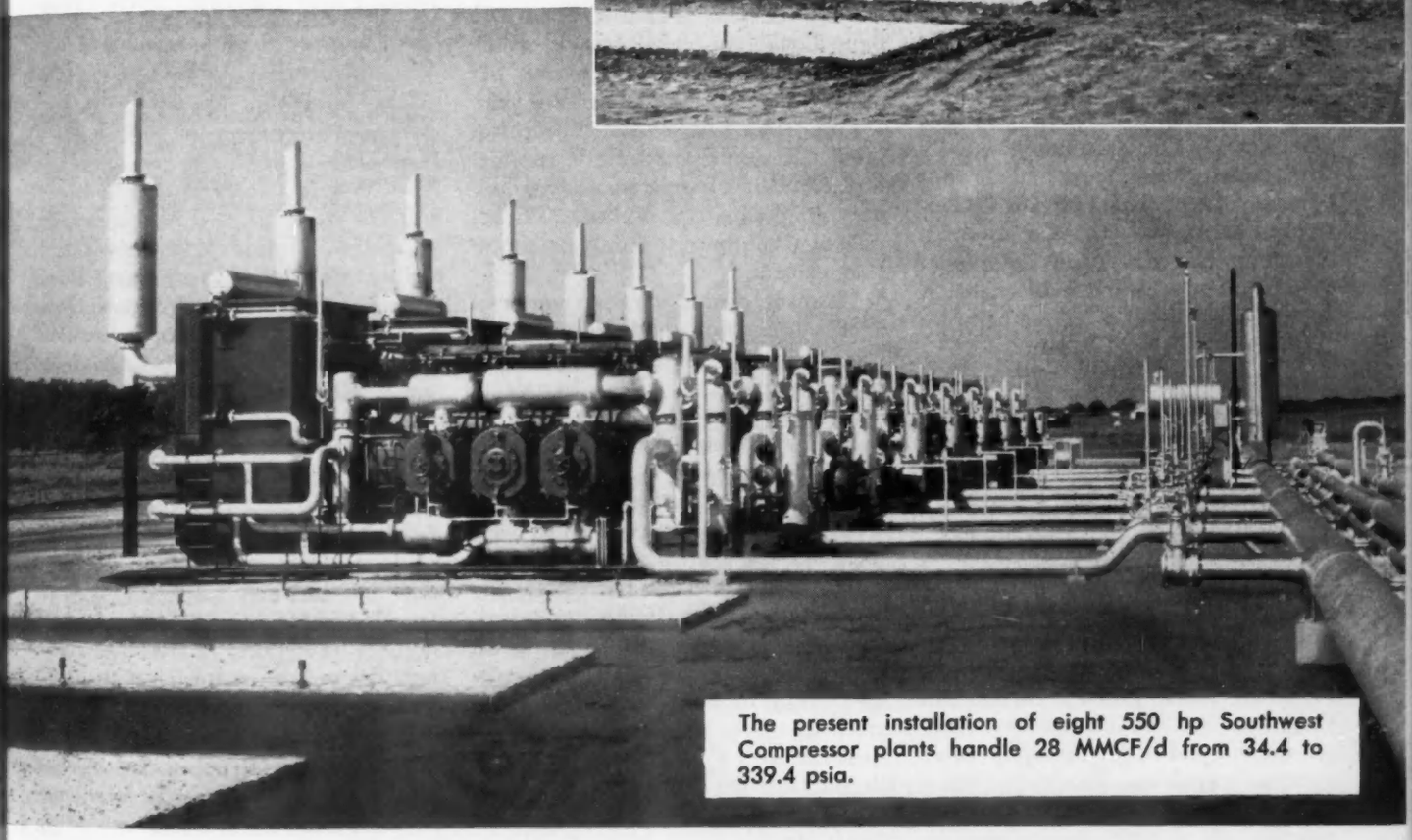

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plants were operating in Venezuela, with a combined effective injection rate of 705 MMcf daily, according to the Ministry of Mines and Hydrocarbons of the Venezuelan government. In addition, 11 water injection plants were serving pressure maintenance and secondary recovery projects in Venezuela as of the end of last year.

By the end of 1957, more than 600 miles of pipe lines to provide natural gas to Venezuelan industries and homes had been completed. The City of Maracaibo has gas service for domestic uses.

**Methane Transportation.** A possible program for enhancing the use of Venezuelan gas in addition to exercising a profound effect on the international oil industry was the project to move liquid methane by tanker from Venezuela to England. In 1955, Continental Oil Company, jointly with Union Stock Yard and Transit Company of Chicago formed Constock Liquid Methane Corporation. Constock has developed equipment and techniques which may enable it to move methane at a temperature of minus 285° F. in tankers.

Constock and the British Gas Council formed a jointly-owned firm which was building an experimental 3,000-ton tanker for this purpose. If trial runs, scheduled for 1958, prove the project to be feasible, appropriate facilities and larger tankers were to be built.

**Political Situation.** As of midyear, 1958, the revolution that overthrew President Perez Jimenez earlier this year had had no discernible effect on the oil industry. Promptly after Jimenez' expulsion, Provisional President Wolfgang Larrazabal called a meeting of industry representatives on February 5 and assured them that they need not fear the government provided the industry continued to cooperate with it. Plans were for a general election this fall for a new government which would take office in April, 1959. Thus, no changes in the government's attitude toward the oil industry appeared imminent, though the government was reported to be considering forming a new oil agency that would enter joint ventures with new private concessionaires, similar to those being formed in Iran.

# Austria . . . Industry staggering under its burden of oil deliveries to Russia and sagging output

Austria's oil industry ended 1957 with:

- Decreasing oil production.
- Increasing natural gas production.
- Important attempts to clear up the indemnification of pre-war Western oil interests.
- The increasingly heavy burden of compensatory oil deliveries to Russia.

**Oil production.** Although 824 were producing at year's end, as compared with 737 at the close of 1956, crude production declined 7 percent. Output for the year 1957 amounted to a daily average of 59,242 barrels, which was an average of 4,505 barrels per day less than during the previous year.

For 1958 a further sizable drop was predicted. Anticipated crude production of 50,956 barrels per day would be tantamount to a decline from last year of 8,286 barrels a day, or almost 16.3 percent.

However, during the first quarter of 1958, production had slipped only about 9.3 percent—from a daily average last year of 15,094 barrels to 13,680 barrels.

In 1957, Oesterreichische Mineraloel Verwaltungs A. G., the Austrian state oil agency produced an average of 55,927 barrels of crude daily, with the non-OeMV firms accounting for a daily average of 3,288 barrels. Of the relatively small private producers, Rohoelgewinnungs A. G. produced an average of 2,050 barrels daily in the East Austrian fields and an average of 83 barrels per day from the Upper Austrian well Puchkirchen 1. Erdoel Produktions Gesellschaft produced an average of 198 barrels a day, and Van Sickle Company accounted for an average production of 512 barrels.

**Natural gas production.** An upturn in natural gas output was a bright spot in Austria's oil industry last year. Production rose in 1957 to more than 26.8 billion cubic feet as compared with 25.9 billion cubic feet during 1956, tantamount to a 1.8 percent increase.

**Drilling.** Austria's state-owned oil company, which took over Aug. 13, 1955, from SMOA, drilled 12 percent more hole last year than in 1956. The monthly average drilling rate in 1957 was 61,022 feet, as compared with 59,382 feet during 1956.

**Austria's 1958 Drilling Plans Reflect a 34 Percent One-Year Drop**
(In feet)

| YEAR | Exploration | Deepening | Development | Total |
|---|---|---|---|---|
| 1958—Planned | 131,233 | 76,476 | 267,421 | 475,130 |
| 1957 | 145,583 | 56,227 | 518,199 | 720,009 |
| 1956 | 117,903 | 83,385 | 379,528 | 580,816 |

**Austria's Well Completion Record (1958-Plan, 1957 and 1956)**

| Type of Well | 1958 Plan | 1957 Total | 1957 Successful | 1956 Total | 1956 Successful |
|---|---|---|---|---|---|
| Development | 48 | 106 | 104 | 110 | 110 |
| Deepening | 11 | 3 | 3 | 18 | 15 |
| Exploratory | 131,233 ft. | 16 | 6 | 13 | 4 |

OeMV's wildcatting operations last year were located at Hohenau, Gross Schweinbarth, Pyrawarth, Rutzendorf and Rabensburg, all of which are in the Vienna Basin. Drilling investment amounted to $6,461,500 last year, and OeMV's plans for this year called for the expenditures of almost $5 million.

**Exploration.** Since the decline of old fields made it apparent at the close of 1956 that new oil fields must be found, OeMV last year increased its number of seismic parties from one in 1956 to five at the close of 1957. Two of these parties were from the West German firm Prakla.

Activities of the five parties last year included gravimetric studies of the Tulln-Klosterneuburg area, the northern area of the March field, and seismic operations in the Amstetten

**Austrian Crude Oil Production Drops 7 Percent**

| COMPANY | CRUDE OIL PRODUCTION 1957 | 1956 |
|---|---|---|
| Austrian Mineral Oil Administration | 20,413,443 | 22,041,228 |
| Erdoel Produktions Gesellschaft | 244,748 | 266,648* |
| Rohoelgewinnungs gesellschaft | 778,583 | 744,907 |
| Van Sickle Company | 186,717 | 214,787 |
| Total | 21,623,491 | 23,267,570 |

* In 1956 the production figure included both AMOA and EPG production in the Goesting Oil Field.

district and in the Laaanoder-Thaya area.

In addition, two private companies have been exploring for new oil sources: RAG, which operates in Styria and in Upper Austria province, and a newly-founded company in Vorarlberg Province.

Work done in this sector in the past led to the discovery of these new deposits:

- Wegscheid—RAG discovered oil Jan. 17, 1958, in this Upper Austria province.
- Pyrawarth—discovered by OeMV in October, 1957, northeast of Matzen.
- Vienna—Suessenbrunn 3 discovery.
- Spannberg—discovered at the end of 1956 by OeMV.

The largest private producer in Eastern Austria and the first successful producer of oil outside Austria's traditional oil-producing area, Rohoelgewinnungs A.G. (Standard Oil and Shell) has spent almost $2 million in exploratory geophysical and drilling operations in Upper Austria. Five indicated structures have been discovered by RAG during the past decade. Success came in 1956 with Puchkirchen 1, which now produces an average of 80 barrels daily of paraffin-base crude.

After seven dry holes, RAG brought in Wegscheid 1, which has been producing since Jan. 17, 1958.

RAG completed 6,684 seismic holes from 1948 to Nov. 30, 1957, reflecting a footage of 715,875 feet. The company currently operates seismic parties both in Upper Austria and in Radkersburg and Wildon district (south and southeast of Styria province). A deep well was scheduled to be drilled in the latter area.

**Pipe lines.** OeMV last year completed the natural gas pipe line gathering system at Matzen field to facilitate transporting gas to Auersthal. Scheduled for completion late this year was the 22.37-mile gas pipe line linking Zwerndorf field to the Schwechat refinery.

A 41.61-mile gas pipe line was scheduled to be constructed by Niogas, the Lower Austrian provincial gas company, to connect the industrial centers in the northern part of Styria province with the gas fields at Schwechat.

**Indemnification.** Initial action to implement the Vienna Memorandum of May, 1955, was taken during 1957 when the Kagran and Floridsdorf refineries were returned to pre-war owners. The government decided Dec. 5, 1957, to return the Lobau refinery and the Zistersdorf-Lobau pipe line to their former Western owners. Still unsolved was the problem of indemnification for lost concessions and the resultant losses of revenues from those fields.

Implementation of the Vienna Memorandum has been (and still is) a grave political issue. The coalition government has indicated its intent to fulfill the agreement's provisions, and Communist opposition (4.5 percent of the nation's voters) decry each effort taken.

**Oil deliveries to Russia.** Meanwhile, during 1957, more than 7.5 million barrels of Austrian oil—about 35 percent of production—was delivered free to Russia's accounts in East Germany, Czechoslovakia, Poland and Hungary. These shipments comprised 76.8 percent of Hungary's total crude imports and 43.5 percent of all Polish crude shipments.

These deliveries bit sharply into Austria's own oil industry since domestic demand for oil increased last year, except for kerosine which recorded a reduction of 20.96 percent in demand. Increases included 14.38 percent for gasoline; 5.5 percent for diesel fuel; 1.8 percent for lubricants.

**Refining.** OeMV's refinery crude charging capacity was reduced last year to about 37,000 barrels daily after the Kagran and Floridsdorf refineries were returned to their pre-war owners.

# Belgium . . . Group awaits exploration permit as interest is stirred in oil-shy nation

INTEREST IN the oil and gas possibilities of northeastern Belgium along the Dutch border has increased somewhat in the past year. A sedimentary section of considerable thickness exists there, and the oil potential of the area has not yet been examined thoroughly. Prospects may be enhanced somewhat by significant discoveries made in western Holland in recent years.

Société Campinoise de Recherches et d'Exploitations Miniéres, a group formed by Petrofina and certain Linbourg coal interests, was awaiting action on an exploration permit application covering 1,467 square miles in northeastern Belgium at the end of 1957. It would include almost all of the Campine region of Antwerp and Linbourg provinces, north of Turnhout to the Dutch border, according to the American Association of Petroleum Geologists *Bulletin*.

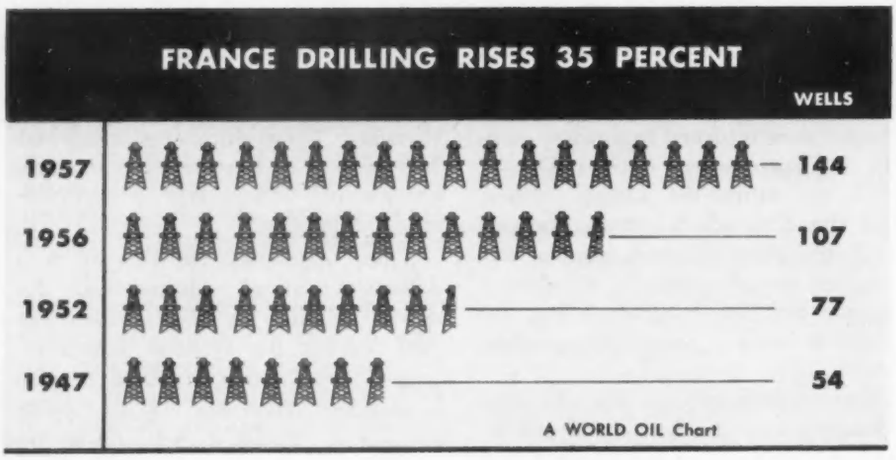
Any crude oil found would find a ready domestic market. All of Belgium's oil needs must be imported, and it has a vigorous oil refining industry.

# Denmark . . . Danish-American speeding up drilling and seismic exploration programs

DANISH-AMERICAN Prospecting Company, holder of the exploration concession covering all of Denmark (10,262,400 acres), was acquired by Standard Oil Company of New Jersey from Gulf Oil Corporation in February, 1957. Under its new management, DAPCO put two seismic crews in the field in July, 1957, and spudded Vemb 1 in western Jutland about 10 miles from the North Sea coast on Dec. 14, 1957.

By the end of December, the well had reached 1,868 feet. It later was abandoned as a dry hole on Jan. 25, 1958 at 6,430 feet.

Drilling is being done for DAPCO under contract by Kellogg Overseas Corporation. The drilling program was processing very rapidly. Flyvbjerg 1, abandoned July 5, 1958, at 5,580 feet was the fifth dry hole already completed by DAPCO this year. The rig was being moved to Horsens, where the next in the series of wildcats was to be drilled. DAPCO continued to find a thick section of marine shale in Denmark, but was having difficulty locating any sands or other likely reservoir beds.




# France . . . Crude oil production hits record level of 28,871 barrels per day

RAPID STRIDES toward improving France's fuels picture were made by the oil industry in 1957 and 1958, at home and in parts of the French Union, including these developments in metropolitan France:

- Crude oil output rose last year to a record level of 28,871 barrels daily, boosting the total to more than 10 million barrels for the year. Parentis field, now thoroughly developed, produced 85 percent of the total.
- A number of new exploration and development permits were assigned.
- An encouraging wildcat discovery in the Paris Basin was being completed in the spring of 1958.

**SNPA.** Societe Nationale des Petroles d'Aquitaine continued active exploratory drilling, completing 41 wells in 1957, or 28.5 percent of the 144 completions credited to metropolitan France last year. Three deep tests were completed in the lower Lacq high-pressure gas pay. Five other deep extension tests in the area were being drilled at year's end.

Sauvelade 101, a four-mile westward stepout, was abandoned as dry at 12,884 feet above the deep (Neocomian) gas pay. Lacq 114, an important northwest stepout, was drilling at 9,285 feet late last year. Proved natural gas reserves exceeded five trillion cubic feet at Lacq (deep zone) at the end of 1957.

In March, 1957, SNPA found oil in its second test on the flank of a diapir 10 miles southeast of Dax at Clermont 2, located 60 miles southeast of Parentis. Production was established in Albian sandstone (Cretaceous) at 6,340 feet. The discovery well had produced about 3,000 barrels of oil by the end of 1957.

**Esso REP.** Development of Parentis field continued, with 26 productive wells having been completed by the end of 1957. A pressure maintenance program was initiated in the lower Neocomian (dolomite) pay zone during the year, with water being injected into two wells in the southeastern part of the field, at the combined rate of 12,500 barrels daily.

A deep test was drilled in the eastern part of the field at Parentis 101. Between 12,270-12,303 feet, a strong flow of wet gas occurred, with an indicated bottom-hole pressure of 8,500 psi. The well was completed as an oil well, flowing 46-gravity crude. However, the flow was reported declining rapidly on production tests.

Development of Lugos field, a 1956 Esso REP discovery, has proved fruitful. Three wells were flowing 20.5-gravity oil at the end of the year. Lugos' 320 barrels per day production rate in 1957 placed it fifth among producing French oil fields during the year. Lugos is located 10 miles northwest of Parentis. The other 1956 discovery, Lucats, 4½ miles east of Parentis, has been disappointing, with still only the discovery well producing at the end of 1957. After several unsuccessful attempts to extend Mothes field, a 1955 discovery, Esso was reported to have completed a second producer there at midyear 1958.

**PETROREP.** Societe Petroliere de Recherche dans la Region Parisienne carried out a core drill program east of Paris, completing 14 holes representing 57,416 feet of hole, with two others being drilled at the end of 1957. A prospect near Coulommiers, 35 miles east of Paris had been chosen for testing by early 1958.

In March, the first well was reported flowing 50 barrels of 44.5 gravity crude oil on a 75-minute open-hole drillstem test from the Dogger (Jurassic) at about 6,000 feet.

**Fropex.** Other active exploration in the Paris Basin was carried out by Societe France Outre-Mer de Prospections et Exploitations Petrolieres (FROPEX). Sennely 1 and Marchenoir 1, located south of Paris near Orleans, were both dry holes, and FROPEX spudded its third test at Vernon 101, located 44 miles northwest of Paris at the end of the year. Four seismic crews were working prospective areas.

**PREPA.** Societe de Prospection et Exploitations Petrolieres en Alsace continued active exploration and development work in the Rhine graben. PREPA drilled 30 wells totaling 102,692 feet of hole during 1957. Two others were drilled at the year's end. Development of Scheibenhard and Eschau was emphasized, with 16 wells being completed in these fields last year.

**Exploration by other groups.** Regie Autonome des Petroles (RAP) increased natural gas production from the old St. Marcet field near the Pyrenees to meet increased demand last year.

Societe des Petroles de la Garonne (SPG) completed four tests in the Toulouse region north of St. Marcet. Compagnie d'Exploration Petrolieres (CEP) continued minor crude production from Gallician field in the Languedoc Basin and was maintaining a rig for wildcatting in the same region. CEP completed three tests in the Paris Basin, including Puiselet 1, which was drilled to 7,408 feet and which found oil shows in the Jurassic.

Societe Francaise de Recherches et d'Exploitations de Petrole (SAFREP) completed five dry holes on its Jura permit during 1957. Societe des Petroles de Valence (SPV) completed

## Crude Oil Production in France in 1957*

| NAME OF FIELD | Operating Company | Basin | Crude Oil Production In 1957 (Barrels) | 1957 Daily Average Production (Barrels) | 1956 Daily Average Production (bbls) | Percent Increase or Decrease, 1957 | No. of Wells Completed To End 1957 | No. of Wells Producing At End of 1957 | | Gravity API |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Flowing | Artificial Lift | |
| Parentis | Esso REP | Aquitaine | 8,730,974 | 23,920 | 20,157 | + 18.7 | 28 | 20 | 5 | 32.7 |
| Lacq (Upper Zone) | SNPA | Aquitaine | 858,378 | 2,352 | 4,573 | — 48.6 | 39 | 17 | 13 | 21.8 |
| Pechelbronn Area | Pechelbronn | Rhine Graben | 199,057 | 545 | 641 | — 15.0 | 453 | 4 | 328 | 26–36 |
| Scheibenhard | RPEPA | Rhine Graben | 117,500 | 322 | 16 | +1912.5 | 13 | 11 | 2 | 32 |
| Lugos | Esso REP | Aquitaine | 116,847 | 320 | ..... | ..... | 3 | 3 | 0 | 20.5 |
| Mothes | Esso REP. | Aquitaine | 113,259 | 310 | 314 | — 1.3 | 1 | 1 | 0 | 21 |
| Eschau | PREPA | Rhine Graben | 43,793 | 120 | 27 | + 344.4 | 8 | 1 | 7 | 34 |
| Donau | PREPA | Rhine Graben | 40,647 | 111 | ..... | ..... | 12 | 0 | 12 | 30 |
| Reiningue | PREPA | Rhine Graben | 26,025 | 71 | ..... | ..... | 3 | 1 | 2 | 40 |
| Staffelfelden | PREPA | Rhine Graben | 12,472 | 34 | 65 | — 47.7 | 2 | 0 | 2 | 40 |
| Lucats | Esso REP | Aquitaine | 12,326 | 34 | 5 | + 580.0 | 1 | 0 | 1 | 37.8 |
| Schirrhein | PREPA | Rhine Graben | 6,491 | 18 | ..... | ..... | 3 | 0 | 2 | 28 |
| Gallician | CEP | Languedoc | 4,372 | 12 | 15 | — 20 | 2 | 0 | 2 | 26 |
| Clermont | SNPA | Aquitaine | 3,000 | 8 | ..... | ..... | 1 | 0 | 1 | 35.7 |
| Total | ..... | ..... | 10,285,141 | 28,178 | 24,871 | + 13.3 | 569 | 58 | 377 | .. |
| **Condensate Production in Barrels** | | | | | | | | | | |
| St. Marcet | RAP | Aquitaine | 175,220 | 480 | 722 | — 33.5 | 16 | 11 | 0 | .... |
| Lacq (Lower Zone) | SNPA | Aquitaine | 60,189 | 165 | 18 | + 816.7 | 7 | 6 | 0 | .... |
| Total Condensate Production | ..... | ..... | 235,409 | 644 | 740 | — 13.0 | 23 | 17 | 0 | .... |

## Natural Gas Production in France in 1957

| Name of Field | Operating Company | Basin | Natural Gas Production In Thousands of Cubic Ft., 1957 | 1957 Daily Average Production In Thousands of Cubic Ft. | 1956 Daily Average Production In Thousands of Cubic Ft. | Percent Increase or Decrease, 1957 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| St. Marcet | RAP | Aquitaine | 13,362,419 | 36,609 | 31,866 | +14.9 | 16 | 11 | 0 | .... |
| Lacq (Lower Zone) | SNPA | Aquitaine | 3,213,665 | 8,805 | ..... | ..... | 7 | 6 | 0 | .... |

* Adapted from **Le Journal des Carburants, Oil and Gas Development and Production,** Society of Petroleum Engineers, and the American Association of Petroleum Geologists **Bulletin.**

three tests in the Rhone Valley, near Lyon, during 1957. Compagnie Francaise de Petroles (Normandie) (CFP-N) continued its core-drilling program on two large permits north and northwest of Paris extending to Dieppe on the coast. The company continued a seismic work program on its Bergerac and Rochefort permits during 1958. Several other companies conducted reconnaissance exploration in France during 1957, without any deep drilling being reported.

**Pipe lines.** Considerable progress has been made in the construction of a pipe line network to move gas, produced and purified at Lacq, to markets. Since Lacq (deep) gas production is expected to amount to 700 MMcf daily by 1961, it was clear that a large pipe line construction program was under way. The main network for increased distribution to southwest France has been completed. Societe Nationale des Petroles des Gaz de Sud-Ouest, owned 35 percent each by RAP and SNPA and 30 percent by Gaz de France, has finished a feeder line from Lacq to Pau, where it is linked with the RAP network for distribution of St. Marcet gas. Another line is from Lacq to Langon, joining the Toulouse-Bordeaux branch of the RAP system, and still another line from Lacq to Bayonne was built.

## Drilling Activity in France in 1957**

| COMPANY | Productive Wells | Dry Holes | Total Wells | Footage Drilled | RIGS ACTIVE AT THE END OF 1957 | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Heavy | Medium | Light | Total |
| SNPA | 4 | 37 | 41 | 244,755 | 11 | 3 | 3 | 17 |
| RAP | 0 | 12 | 12 | 56,103 | 2 | 1 | 0 | 3 |
| SPG | 0 | 4 | 4 | 37,730 | 1 | 1 | 0 | 2 |
| Esso REP | 9 | 8 | 17 | 137,306 | 2 | 2 | 0 | 4 |
| C E P -FROPEX | 0 | 10 | 10 | 48,557 | 0 | 2 | 1 | 3 |
| PETROREP | 0 | 14 | 14 | 57,416 | 0 | 1 | 1 | 2 |
| PREPA | 12 | 18 | 30 | 102,692 | 0 | 2 | 3 | 5 |
| CFP (N) | 0 | 3 | 3 | 16,732 | 0 | 0 | 0 | 0 |
| SPV | 0 | 5 | 5 | 21,325 | 1 | 1 | 0 | 2 |
| SAFREP | 0 | 8 | 8 | 44,948 | 0 | 2 | 3 | 5 |
| Total | 25 | 119*** | 144*** | 767,564 | 17 | 15 | 11 | 43 |

** Reprinted from the **Bulletin,** American Association of Petroleum Geologists.
*** Totals include three wells drilled for pressure maintenance and six for gas storage projects.

## New Concessions and Permits Granted in France in 1957****

| Name of Company | Size of Area (S) (Square Miles) | Name (S) of Permits | Term of Permit (Years) | Basin | Date |
|---|---|---|---|---|---|
| Esso REP | 416 | St. Sever, Aignan, and Montesquiou | 3 | Aquitaine | 10- 2-57 |
| SNPA | 1,931 | Montelimar | 5 | Aquitaine | 12–22–57 |
| PREPA | 2.2 | Soufflenheim | 5 | Rhine Graben | 5–28–57 |
| PREPA | 0.6 | Reiningue | 5 | Rhine Graben | 11–23–57 |
| PREPA-Transworld Petroleum | 1,087.6 | Provence | 4 | Rhone Valley | 2- 3–57 |
| PREPA-Transworld Petroleum | 1,374.1 | Haut-Jura | 5 | Jura | 2–26–57 |
| PREPA-Transworld Petroleum | 292 | Chablais | 2 | Jura | 2–26–57 |
| PREPA-Transworld Petroleum | 483.4 | Haute-Savoie | 3 | Molasse | 2–26–57 |
| PREPA | 235.5 | Escource-Belmont | 3 | Aquitaine | 10- 2–57 |
| PREPA | 283.5 | Tarbes-Sauveterre | 3 | Aquitaine | 9–30–57 |
| CEP | 631 | St. Estephe | 3 | Aquitaine | 9- 2–57 |
| CEP | 730 | Gabarret | 3 | ..... | 9–30–57 |
| SAFREP | 438 | Mont de Marsan | 3 | ..... | 10- 2–57 |
| SAFREP | 124 | Biarritz | 3 | ..... | 11- 5–57 |
| COPESEP | 1,700 | Aube and Yonne | 4 | Paris | 5–24–57 |
| SPV | 105 | St. Julien-en-Born | 3 | ..... | 10- 2–57 |
| Mobil Oil Francaise | 1,224 | Aisne | 4 | Paris | 2–26–57 |
| Mobil Oil Francaise | 1,795 | Blois | 5 | Paris | 6–12–57 |
| Mobil Oil Francaise | 1,052 | Bordeaux | 5 | Aquitaine | 2- 9–57 |
| Mobil Oil Francaise | 402 | Sabres | 3 | Aquitaine | 9–30–57 |
| SAPCO and MOFAG | 772 | Mareuil-Sarlat | 3 | Aquitaine | 11- 5–57 |
| Total | 15,079 | | | | |

**** Adapted from Le Journal des Carburants.

Cantilever rig on Harme 6 of the Gewerkschaft Brigitta-Mobil Oil group.

# West Germany . . . New discoveries

## bolster nation's oil reserves as drilling sets record

WEST GERMANY'S crude oil production expanded steadily in 1957 and early 1958 as exploratory activities continued at a high level and as new discoveries bolstered the nation's reserves.

One problem for the West German crude producers was the agreement on the Common European Market, which foresees the abolishing of protective duties for crude oil and petroleum products either gradually beginning on Jan. 1, 1959, or in one stage after a period of six years. The West German government apparently prefers the latter course. The position of other member countries (France, Italy and the Benelux countries) was not clear.

As soon as the oil tariff is removed, a subsidy system may be introduced to prevent shutdown of exploratory efforts. There is little doubt that only a few oil producing districts of the country could continue to operate if crude must be evaluated at world market quotations plus freight only.

**Drilling.** A new all-time record was set in 1957 with the drilling of 2,533,720 feet, which was 210,941 feet, or 9.1 percent, more than the total amount of hole drilled in 1956. Of the 561 deep wells completed last year, 400 or 71.3 percent were producers. A total of 362 wells completed last year were drilled in known fields, of which 318 struck oil while 19 found natural gas.

The remaining 199 wells were wildcats or extension wells, of which 48 found oil, 15 encountered gas and 136 were dry.

The exploratory wells (wildcats and extensions) continued to represent a high proportion of the total footage (44.9 percent in 1957). The average depth of the exploratory wells was considerably higher than that of the development wells, showing the trend for exploring deeper pays.

More wells were completed in 1957 in the new oil province between the Weser and Ems rivers than in any other in West Germany—178. Hannover followed with 117, Emsland with 97, and the Upper Rhine Valley with 85.

German crude oil producing companies have indicated that 2.7 million feet of hole will be drilled during 1958, including 1.6 million feet in exploratory wells. About 140 rotary rigs and 130 shallow drilling units were active early in 1958. Turbodrills were being tested, especially for drilling deviated holes.

**Production.** Crude oil production in West Germany amounted to 28,113,451 barrels in 1957, an increase of 3.2 million barrels, or 12.9 percent, from 1956. The daily average for 1957 was 77,023 barrels as compared with 68,203 barrels in 1956.

The upturn in crude output continued in 1958, and since a daily rate of 84,007 barrels was achieved in April 1958, there seems little doubt that West Germany would reach a record of 90,000 barrels per day in the near future. There may be added

**1957 West German Crude Oil and Natural Gas Production, and Drilling**

| REGION | Crude Oil Production During 1957 In Barrels | Natural Gas Production During 1957 In Thousands of Cubic Feet | No. of Crude Oil Producing Wells, 12-31-57 | No. of Natural Gas Producing Wells, 12-31-57 | No. of Wells Drilling as of 12-31-57 | Footage Drilled During 1957 | Field and Extension Wells Completed During 1957 | | | | Wildcat Wells Completed During 1957 | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Oil | Gas | Dry | Total | Oil | Gas | Dry | Total | |
| Schleswig-Holstein-Hamburg | 3,141,573 | ..... | 275 | .. | 5 | 219,660 | 23 | 0 | 3 | 26 | 2 | 0 | 9 | 11 | 37 |
| Emsland | 8,807,356 | 4,082,202 | 932 | 11 | 14 | 362,760 | 81 | 3 | 6 | 90 | 1 | 0 | 6 | 7 | 97 |
| Weser-Ems | 5,511,453 | 6,065,704 | 453 | 5 | 36 | 694,850 | 142 | 2 | 11 | 155 | 6 | 0 | 17 | 23 | 178 |
| Hanover | 9,585,497 | 72,431 | 1,447 | 3 | 28 | 606,800 | 68 | 1 | 19 | 88 | 5 | 0 | 24 | 29 | 117 |
| Upper Rhine Valley | 840,484 | 2,164,209 | 182 | 44 | 13 | 354,280 | 27 | 16 | 24 | 67 | 2 | 0 | 16 | 18 | 85 |
| Alpine Foreland | 227,079 | 227,358 | 16 | 2 | 17 | 226,530 | 9 | 10 | 9 | 28 | 0 | 2 | 10 | 12 | 40 |
| Others | ..... | ..... | ..... | .. | 3 | 28,840 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 7 | 7 |
| Total | 28,113,451 | 12,611,904 | 3,305 | 65 | 116 | 2,533,720 | 350 | 32 | 72 | 454 | 16 | 2 | 89 | 107 | 561 |

incentive for operators to increase production while tariff duties on imports still are high and the price of domestic crude supported in anticipation of potentially lower prices after the Common Market takes effect.

**Crude reserves.** The German geological Survey published a new estimate of proved crude reserves for West Germany as of Jan. 1, 1958—379 million barrels, up 12 million barrels from the end of 1956.

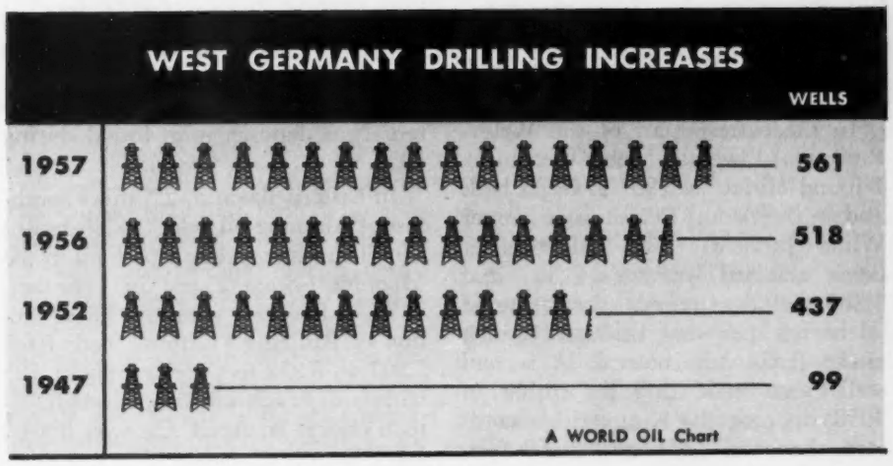
In view of these figures, the forecast of the Association of Crude Oil Producers for an output of about 34 million barrels in 1962 appeared justified. At the end of 1957, 3,305 oil wells were producing in Germany, most of which were on pump.

**Natural gas.** The output of West Germany's natural gas fields declined by 2.6 percent during 1957, amounting to 12,612 MMcf. This decrease had no bearing on the potential of the gas fields, but was due to reduced purchases by industrial enterprises to which the gas from North German production districts is supplied.

**Pipe lines.** Preparations were made in 1957 for the building of the 220-mile, 28-inch crude oil pipe line from Wilhelmshaven harbor on the North Sea to the Rhine-Ruhr district. Pipelaying was started in the beginning of 1958, and the line was expected to begin operating at the end of 1958.

A second major pipe line to be built to the Ruhr refining center near Cologne will connect Rotterdam, Godorf and Wesel, all located on the Rhine River. This will be the first section of the proposed trans-European pipe line system (SAPPEUR) between Rotterdam and Marseilles. The projected Rotterdam-Godorf-Wesel line is slated to begin operating in midyear 1960. An operating company, N V Rotterdam-Rijn Pijpleiding Mij, has been formed with headquarters at The Hague. Its shares are owned by Royal Dutch Shell (40 percent), a Socony Mobil Oil Company affiliate and Gelsenberg Benzin A G (40 percent), and Caltex (20 percent). The line will be 24-inch, and initial throughput is to be about 135,000 barrels daily. It is intended primarily to supply the Shell Refinery under construction at Godorf and Gelsenberg Benzin's Gelsenkirchen Refinery with crude.

**Refining.** The throughput capacity of West German refineries was increased by about 50,000 barrels daily during 1957 to 350,000 barrels per day.




**Exploration.** The search for deeper oil horizons was continued in 1957. Gewerkschaft Elwerath Z 1, testing the deep Zechstein, was drilled below 13,000 feet. The record well, Cismar 3, in Holstein province, drilled by Gewerkschaft Brigitta, reached 14,800 feet. Some Zechstein wells located west of the Weser River found some deep deposits of natural gas.

**New discoveries.** None of the new 1957 oil discoveries appeared to be of major economic value, although both crude oil and natural gas reserves increased despite heavy production.

In Schleswig-Holstein, the northernmost oil province, Warnau 2a, a wildcat drilled jointly by Deutsche Erdoel A G and Gewerkschaft Elwerath about nine miles west of the town of Ploen, struck oil in June, 1957, in the Dogger beta formation in the interval 8,168-8,194 feet. The deposit appeared to be narrow and on the same structure as the nearby Boostedt-Ploen field, that is, on the East flank of the Bramstedt-Boostedt-Wankendorf elongated salt upthrust. In April, 1958, the new well produced about 1,400 barrels of 35-gravity crude.

In October, the Curslack 3 well, drilled jointly by Mobil Oil and Preussag, encountered some oil in the lower Dogger on a block on the southeastern flank of the Reitbrook structure in Hamburg district.

In Hanover province, Wintershall A G and Elwerath were successful with their pioneer well, Meckelfeld-Sued 1, located 1.5 miles southeast of the old Meckelfeld oil field. The wildcat struck oil-bearing sandstone in the Dogger beta between 6,232 and 6,249 feet. In February, 1958, a second well came in, extending the new field to the northeast. In April, 1958, the two wells together produced about 5,000 barrels of crude.

In the Hardesse-Hasebrueck area southeast of Celle, where several dry holes were drilled in recent years, Deutsche Erdoel and Mobil Oil drilled Hardesse 4, a wildcat located 7.5 miles west of Gifhorn. It encountered oil-bearing Dogger beta at about 6,000 feet. The well flowed about 70 barrels of 34.5 gravity crude daily through 1/6-inch choke.

In the Weser-Ems province, Brigitta and Mobil found oil at Varel 4, among several other discoveries made during 1957. The Varel well is located a few miles south of the Jade Belt (North Sea Coast). Crude oil (26 gravity) was found at Varel 4 in the Elsfleth sandstone (middle Dogger) in the interval 5,071-5,136 feet. A production test yielded about 125 barrels daily through 1/8-inch choke. In April, 1958, Varel produced about 1,600 barrels of crude.

In August, 1957, the Brigitta-Mobil Molbergen West 1 wildcat, located two miles northwest of the small Molbergen oil field in south Oldenburg, struck oil in Middle Kimmeridge beds between 4,915 and 4,954 feet. Initially, about 70 barrels of 36-gravity oil daily was pumped. April, 1958, output amounted to 2,600 barrels.

A promising discovery at Brigitta-Mobil Welpe 1, located about two miles south of Vechta in South Oldenburg, came in during May, 1957. The first test of the Middle Kimmeridge sand from 6,270 to 6,280 feet yielded 110 barrels of 32-gravity crude through 1/8-inch choke.

A second test at Welpe, one mile east of the discovery, was successful, apparently in a different fault block,

but also producing from the Kimmeridge. Welpe's yield of 18,000 barrels in April, 1958, gave it top rank among the new discoveries of 1957.

In the eastern part of the Weser-Ems area, Elwerath-Mobil Wehrbleck 1 found oil late in 1957 in Gigas beds and in the Aldorf Serpel lime (upper White Jurassic). The Aldorf, after being acidized between 3,367 and 3,385 feet, was tested at the rate of 90 barrels per day through 1/6-inch choke from this interval. A second well came in during the spring of 1958, opening the Kimmeridge sandstone between 3,456 and 3,469 feet. This well showed the faulted nature of the Wehrbleck structural high, similar to nearby fields. April, 1958, production from Wehrbleck amounted to 1,800 barrels of crude.

In the southeast part of Aldorf oil field in the Weser-Ems district, Dueste Z 1 well struck high-pressure gas at 10,300 feet.

In the Emsland province, a new field in the Emlichheim district close to the Dutch border was developed in 1957 by Wintershall A G. Considering Emlichheim, Emlichheim-West, Ruehlertwist, and Ruehlermoor fields as a unit with Schoonebeek oil field straddling the German-Dutch border, this is one of the most productive oil-producing areas in Europe. At Emlichheim-West, some wells came in at about 3,000 feet producing from the Valendis and Hauterive horizons.

Southeast of Emlichheim, natural gas was found early in 1958 by C. Deilmann, Elwerath, Preussag and Wintershall in a jointly-drilled wildcat, Kalle 1. Production was from the main Zechstein dolomite between 8,957 and 9,088 feet. Tests indicated that the well was a commercial producer.

Two early 1957 discoveries in the Upper Rhine Valley between Landau and Karlsruhe have undergone development. A second oil pay zone was found at Leopoldshafen 2 in upper Cyrene marls (Tertiary). The original pay zone was found in Meletta beds. In April, 1958, Leopoldshafen produced 4,000 barrels of crude. The other discovery, Hayna, has proved disappointing; April, 1958, output was only 230 barrels.

Between Hayna and Landau, another oil find was made in April, 1958, at Offenbach. Deutsche Erdoel A G Offenbach 1 found oil-saturated Cyrene marl at 3,524 to 3,537 feet. The well was completed on pump for 35 barrels of 36-gravity crude daily.

On the concession east of Munich held by Bayerische Mineral-Industrie A G (a Socony Mobil affiliate), two more gas deposits were found during 1957.

In eastern Bavaria, 2.5 miles southeast of Ampfing oil field, the Elwerath-Mobil-Preussag group struck oil in the Muehldorf-Sued 1 test in February, 1958. A flow test from the lower section of Ampfing (Lattorf) beds from 5,907 to 5,922 feet yielded about 125 barrels of crude oil daily through 1/8-inch choke. In April, the well flowed 2,100 barrels of crude.

In the Molasse Basin in the Alpine Foreland, an oil discovery in March, 1958, brought encouragement to this area, which had been disappointing up to that time. The first apparently commercial deposit was found in Wuertemberg Province at Wintershall-Elwerath, Moenchsrot 2, located south of Ulm about eight miles west of Memmingen, not far from the Heimertingen oil field on the Bavarian side. Oil-saturated Freestone beds were found, and the well was completed as a pumper from the interval 4,811-4,852 feet. April, 1958, production was 2,600 barrels of crude oil.

**Supply and demand.** Oil consumption in West Germany increased by 11.5 percent to 110 million barrels (301,370 barrels daily) during 1957. Domestic refinery throughput was 85 million barrels (233,000 barrels daily).

# Great Britain . . . Duke's Wood leads producing areas as peak year is recorded

GREAT BRITAIN's brightened oil outlook during 1957 and 1958 as crude oil production rose and as new sources of oil and gas were found. Crude oil production was increased to a record level of 614,384 barrels in 1957, for a daily average of 1,683 barrels. This was a 25.8 percent rise as compared with the 1,338 barrels daily reported in 1956. The average monthly production during 1957 was 51,198 barrels, surpassing even the January yield of 49,000 barrels.

Duke's Wood field, located near Nottingham, led with production of 217,869 barrels last year. There were 108 producing wells at the end of December at Duke's Wood. Egmanton field, found in 1955, was a close second, raising production to 207,894 barrels in 1957. Development drilling was centered in Egmanton, where 27 oil wells and five dry holes were completed last year, and 23 wells were pumping at the end of December with 21 other wells shut in.

**Exploration.** Exploration activity was vigorous, with three seismic parties operating in Britain early last year, later reduced to two crews. BP Exploration Company, Ltd., completed six wildcats last year, and four more were drilling at the end of December. A gas well was completed at Trumfleet near Richmond in North York. Initial potential was 200 Mcf daily from 3,328 to 3,352 feet. Total depth was 5,184 feet. At Langar 1, near Plungar at the south end of the productive Midlands trend, an oil well was brought in at 2,744-2,758 feet in the Rough Rock horizon of the Mill-

**Production and Drilling in Great Britain in 1957**

| Name of Company | Name of Field | Crude Oil Production in 1957, in Barrels | Number of Crude Oil Producing Wells At End of 1957 | | | Number of Field Wells Drilled During 1957 | | | | Amount of Footage Drilled During 1957 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pumping* | Shut In | Total | Oil | Gas | Dry | Total | |
| BP Exploration Company, Ltd. | Caunton | 9,519 | 10 | 1 | 11 | 0 | 0 | 0 | 0 | 0 |
| | Duke's Wood | 217,869 | 108 | 3 | 111 | 0 | 0 | 0 | 0 | 54 |
| | Eakring | 46,431 | 42 | 4 | 46 | 0 | 0 | 0 | 0 | 0 |
| | Egmanton | 207,894 | 23 | 21 | 44 | 27 | 0 | 5 | 32 | 108,265 |
| | Formby | 985 | 10 | 0 | 10 | 0 | 0 | 0 | 0 | 0 |
| | Kelham Hills | 106,920 | 41 | 2 | 43 | 0 | 0 | 0 | 0 | 0 |
| | Plungar | 24,036 | 7 | 4 | 11 | 2 | 0 | 1 | 3 | 9,234 |
| Esso Petroleum Company Ltd. | Dalkeith | 730† | 2 | .. | .. | .. | .. | .. | .. | .. |
| Totals | | 614,384 | 243 | 35 | 276 | 29 | 0 | 6 | 35 | 117,553 |

Number of exploratory wells completed in 1957—14.
Total footage of exploratory wells completed in 1957—24,722.
Total exploratory and development footage drilled in 1957—142,275.
* No flowing oil wells existed in Great Britain as of the end of 1957.
† Estimated.

stone grit for about 220 barrels of crude daily. Total depth was 3,236 feet.

In midyear 1958, a wildcat test drilled by BP about 18 miles north and slightly east of Egmanton reportedly flowed oil from 4,400 feet.

Other exploratory drilling last year included dry holes at Upholland 1, Brightling 1, Robin Hood's Bay 1, and Askern 1. Eight geological holes, aggregating 4,183 feet, were drilled in the Formby area. The 142,275 feet of hole drilled, including 117,553 feet of development drilling and 24,722 feet in wildcats, was more than double the 70,320 feet recorded in 1956.

# Greece . . .

## Testing continues

EXPLORATION continued in Greece during 1957 and 1958 without encouraging results. In Greek Thrace, the Greco-West German group composed of Hellenic Sun Oil Field Exploration and Development S A (Ilios) and C. Deilmann Bergbau GmbH of Bentheim, Germany, continued operating one rig on wildcats. Evros 1, located in the Ferrai vicinity near the Turkish border, was spudded in 1956 and was abandoned as dry in August, 1957, at a total depth of 7,722 feet. At the end of 1957, the group was drilling another wildcat, Tavri SW 4, in the same general structural trend as the Ardanion 1 dry hole abandoned in 1956.

In far southwestern Greece, Israel Mediterranean Petroleum Inc. and Pan-Israel Oil Company Inc. drilled seven shallow holes on their 120,000-acre concession covering Zante Island. This work was begun in March and completed on June 3, 1957. The portable drilling rig was then shipped back to Israel. The test holes aggregated 6,007 feet drilled. Two perpendicular lines of holes were drilled in the Keri area on 650-foot spacing. Geological evidence indicated that Miocene, Eocene and upper Cretaceous beds were tested, but the extremely heavy oil found in erratic fracture zones was not economic due to excessive salt water associated with it. No new oil deposits were found.

Thus, one full-hole and seven core-tests were completed in Greece in 1957, totaling about 15,000 feet of hole.

# Italy . . . 7.5 percent oil production rise shoves daily average output up to 4,658 barrels

OIL ACTIVITY increased in mainland Italy during 1957 and 1958. The new Italian oil law, finally passed early in 1957 after considerable debate, clarified some issues. The law allowed those companies (e.g., Montecatini) that were to continue the oil search in Italy, to plan and conduct their business accordingly, instead of being specifically forbidden to produce oil by the force of previous, outdated laws.

Ente Nazionale Idrocarburi and its affiliates, AGIP Mineraria, etc., benefiting from the new law's continuation of a virtual state monopoly in the Po Valley and, in effect a preferred position elsewhere on the mainland because of the law's heavy tax obligations imposed on private firms, stepped up its activity. The new Italian law is summarized in WORLD OIL, August 15, 1957, on Page 336.

**Production.** Total crude oil production during 1957 was put at 1.7 million barrels, for an average of 4,658 barrels daily, representing a 7.5 percent boost from the 1956 daily rate of 4,332 barrels. Precise figures on mainland Italy crude production were difficult to determine because official ENI figures cover both mainland Italy and Sicily without a specific breakdown, and crude production by AGIP Mineraria at Gela in Sicily commenced in 1957.

Natural gas production increased at a faster rate. A total of 175,387 MMcf was produced last year, for a daily average of 480.5 MMcf. This was an 11.2 percent boost over the 1956 total of 157,691 MMcf.

A total of 169 full-hole tests were completed in mainland Italy in 1957, aggregating 848,377 feet of hole. Of these, ENI firms drilled 138, including 95 in the Po Valley and 43 in Peninsular Italy. Other (private) companies completed 12 wells in the Po Valley and 19 in Peninsula Italy. In addition, 7,571 feet of stratigraphic drilling was reported in eight shallow holes.

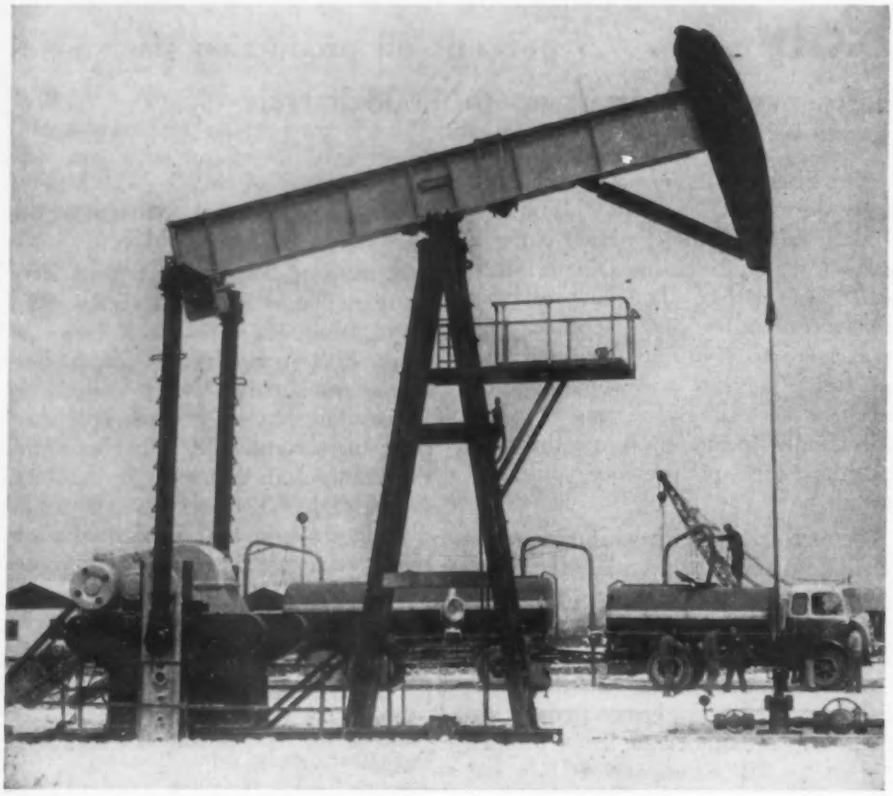
**Exploration.** ENI's rank exploratory efforts on previously-held areas outside the Po Valley were carried out by its affiliate SOMICEM. Of the 17 wildcats completed by SOMICEM last year, only one, Bonanno 1 in Abruzzi, had tangible results. Non-commercial amounts of crude oil were found in Miocene limestone at 5,570 feet. Bonanno 2 was being drilled in 1958.

**New fields.** Minerbio gas field, a 1956 discovery located near Bologna, has been developed rapidly and was third among Italian gas-producing fields by early 1958. In Abruzzi, where 26 wells (including six dry holes) were completed by AGIP Mineraria last year, about 500,000 barrels of crude have been produced during the past two years, and the field was being depleted rapidly. By the end of last year, the production rate had dropped to about 850 barrels per day from 25 wells.

**Drilling in Italy in 1957***

| Area | Company | Development Wells Completed in 1957 | | | New Pool and Outpost Tests | | | New Field Wildcats Completed | | | Footage Drilled in 1957 | Footage Drilled in 1956 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Productive | Dry | Total | Productive | Dry | Total | Productive | Dry | Total | | |
| Po Valley | AGIP Mineraria and Affiliates | 41 | 11 | 52 | 5 | 16 | 21 | 3 | 19 | 22 | 598,251 | 549,787 |
| | Other Companies | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 7 | 7 | 26,490† | ‡ |
| (Total Po Valley) | | 46 | 11 | 57 | 5 | 16 | 21 | 3 | 26 | 29 | 624,741 | ..... |
| Peninsular Italy | AGIP Mineraria and Affiliates | 19 | 4 | 23 | 1 | 2 | 3 | 1 | 16 | 17 | 125,626 | 121,619 |
| | Petrosud | 5 | 5 | 10 | 0 | 0 | 0 | 0 | 3 | 3 | 53,000† | 9,485 |
| | Other Companies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 6 | 45,010† | 27,610† |
| (Total Peninsular Italy) | | 24 | 9 | 33 | 1 | 2 | 3 | 1 | 25 | 26 | 223,636 | 158,714 |
| Total Mainland Italy | | 70 | 20 | 90 | 6 | 18 | 24 | 4 | 51 | 55 | 848,377 | 708,497† |

* Adapted from the American Association of Petroleum Geologists Bulletin and other sources.
† Estimated.
‡ Figure not available.



Pumping well in Gela, a field owned by AGIP Mineraria, a subsidiary of Ente Nazionale Idrocarburi, in Sicily.

# Sicily . . . Third well in new Rosolini oil field, 20 miles from Ragusa, scheduled to be drilled

COMPETITION WAS becoming more intense in Sicily in 1957 and 1958 as AGIP Mineraria, striving to catch up with private industry in the rivalry to provide the greatest contribution to fulfillment of Italy's oil needs, found two new oil fields and two new gas fields.

**Gela.** This discovery was made late in 1956, but the discovery well actually was completed in 1957. AGIP-Mineraria Gela 1, located near the south coast of Sicily about 25 miles west of Ragusa field, struck 7-gravity oil from 10,236-10,498 feet and 10,597-11,056 feet. It flowed about 110 barrels daily, and when pumping equipment was installed, Gela 1 began to produce 1,200 to 1,500 barrels daily by April, 1957.

Gela 1 and 3 were on production at the end of 1957, and Gela 4 started flowing in January, 1958. Gela 5 was being drilled below 13,914 feet by midyear 1958, establishing a depth record for Sicily. Four other wells were being drilled in the Gela field vicinity.

Crude production from Gela in 1957 was put at about 1,000 barrels per day. Production was expected to be expanded as rapidly as the crude could be processed.

**Noto.** CORIS, a company jointly composed of AGIP and Western Geophysical Company, found a new oil field at Rosolini 1, about 20 miles east-southeast of Ragusa field on the Noto permit. Fifty feet of pay indicated production of about 500 barrels daily of 19-gravity crude. Depth of the Noto pay is about 7,000 feet. Further drilling was planned. A second test in the area was being drilled at the end of 1957, and a third was planned for 1958.

**Gas discoveries.** Snia Viscosa, a private Italian firm, holds the Enna license in central Sicily, northwest of Ragusa. A test drilled jointly with AGIP Mineraria found gas, reported to be rich in condensate. Marinella 1, located in western Sicily near Castelvetrano about 80 miles west-northwest of Gela was found in 1957 by AGIP, but the field was thought to be small. In the meantime, AGIP had three gas wells on production at the start of 1957 at Catania field in eastern Sicily, jointly yielding about 1.6 MMcf daily.

**Ragusa.** Ragusa field is benefiting from completion of the 14-inch, 37-mile pipe line to Augusta, dedicated in 1957. Production from Ragusa field increased to an average of 17,781 barrels daily last year. This represents a 97.2 percent increase over the 1956 rate of 9,016 barrels per day, which, in turn, was a 246 percent boost over the 1955 output of 2,614 barrels daily. Gulf Italia completed 15 development wells last year, all of them oil wells in Ragusa field. At the end of December, 29 wells were on production at Ragusa, all of them pumping.

A total of 38 wells, including 18 development and 20 wildcat tests were completed last year, and 17 new tests were being drilled at the end of December. Gulf interests, including Gulf Italia, Gulf-Montecatini, and Mediterranean Oil Company, as well as AGIP and affiliates, Italian Edison, and CISDA (British Petroleum interests) all were carrying on active exploration programs in 1958.

**Drilling and Production in Sicily in 1957**

| Name of Company | Crude Oil Production in 1957, in Barrels | 1957 Crude Production, Barrels Daily | Number of Field Wells Completed in 1957 | | | | Number of Wildcat Wells Completed in 1957 | | | | Number of Wells Drilling on 12-31-57 | Amount of Footage Drilled During 1957 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total | Oil | Gas | Dry | Total | | |
| Gulf Italia | 6,490,000 | 17,781 | 15 | 0 | 0 | 15 | 0 | 0 | 1 | 1 | 4 | 93,924 |
| Gulf-Montecatini | ..... | ..... | .. | .. | .. | .. | .. | .. | 3 | 3 | 4 | 23,000* |
| Mediterranean Oil Company | ..... | ..... | .. | .. | .. | .. | 0 | 0 | 1 | 1 | 0 | 6,563 |
| AGIP Mineraria and Affiliates | 365,000* | 1,000* | 1 | 0 | 2 | 3 | 2 | 2 | 4 | 8 | 6 | 81,827 |
| Italian Edison | ..... | ..... | .. | .. | .. | .. | .. | .. | 7 | 7 | 1 | 49,140 |
| Compagnia Idrocarburi Della Sicilia D'Arcy S p A (CISDA) | ..... | ..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 12,864 |
| Augusta Richerche Petrolifere SpA (ARPE) | ..... | ..... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 200 |
| Total | 6,855,000 | 18,781 | 16 | 0 | 2 | 18 | 2 | 2 | 16 | 20 | 17 | 267,318 |

* Estimated.

# Mediterranean . . .

## Studies under way

INTEREST IN several Mediterranean islands' oil possibilities continued, though no drilling was reported as of midyear 1958.

On Cyprus, Forest Oil Corporation of Bradford, Penn., was sending a photogeological crew to Cyprus for three or four months work during midyear 1958. Forest has a concession dating to January, 1956, covering the entire island with the exception of a small area near Limassol. A local resident has been drilling a well in this vicinity intermittently for a number of years as finances allow. The well

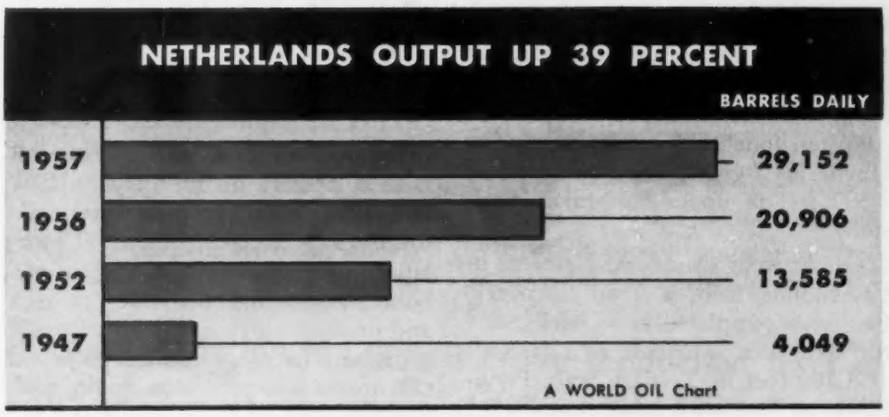
See Insert Map

was reported below 5,000 feet with no shows and also reported in basement.

Forest has had a geologist working the island since the concession was negotiated. Pending results of the photogeologic survey, a seismic crew may be sent to Cyprus.

In Malta, BP Exploration Company was still interested in returning to the island to drill a deep test, despite expiration of its previous exploration license and also despite political trouble between the Maltese and the British.

In Sardina, Wintershall A G of West Germany and the Sardinian government formed a jointly-owned company in 1957 called Societa per Azioni Idrocarburi Sardegna (SAIS) to search for oil on a concession covering the western half of the island (about 3,500 square miles).




# The Netherlands . . . Crude production reaches to almost 30,000 bpd level

EXPLORATION AND production by N V Nederlandse Aardolie Mij in The Netherlands showed unprecedented results in 1957 and 1958. Crude oil production was raised to a record figure of 10,640,451 barrels last year, for an average of 29,163 barrels per day.

This represents almost a 40 percent increase above the 1956 rate of 20,906 barrels daily. The abrupt boost was partly due to the Suez crisis but more as a result of important new oil discoveries made in western Holland since the start of 1953, and pressure maintenance and secondary recovery programs in Schoonebeek field.

Production from Schoonebeek was increased from 6,680,149 barrels in 1956 to 8,584,839 barrels in 1957, following a decline in 1956 from the 1955 total. Production from western Holland fields was boosted above 2 million barrels in 1957.

**Exploration.** Wildcat and development drilling was concentrated in western Holland, where 179,201 feet of hole was drilled as compared with 69,121 feet in Schoonebeek field last year. Five new oil fields were found in western Holland in 1957, including Ridderkirk, located five miles southeast of Rotterdam, where 26.3-gravity crude was found at 3,100 feet and 4,900 feet in the upper Barremian (Cretaceous) and sandstone in the Cretaceous-Jurassic transition zone.

At Zoetermeer, seven miles east of The Hague, 18-gravity crude was found at 3,150 feet in Valanginian (lower Cretaceous) sandstones. At Moerkapelle, 12 miles east of The Hague, 13.3-gravity oil was found at 2,450 feet in various sandstones in the upper Barremian and in unclassified sands lower in the section. At Al-

**Crude Oil Production and Oilfield Drilling in The Netherlands in 1957**

| NAME OF FIELD | Footage Drilled in 1957 | WELLS COMPLETED IN 1957 | | | | No. Wells Drilling, 12-31-57 | WELLS PRODUCING AS OF 12-31-57 | | | | Producing Depth (Feet) | Crude Oil Production in 1957 in Barrels | Crude Oil Production in 1956 in Barrels |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Oil | Gas | Dry | Total | | Flowing* | Pumping | Other Artificial Lift | Total | | | |
| Schoonebeek | 69,121 | 25 | 0 | 1† | 26 | 0 | 0 | 272 | 1 | 273 | 2,500‡ | 8,584,839 | 6,680,149 |
| Rijswijk | 7,923 | 1 | 0 | 0 | 1 | 0 | 4 | 0 | 5 | 9 | 5,100 | 503,324 | 388,595 |
| Pijnacker | 24,865 | 2 | 0 | 1 | 3 | 0 | 4 | 0 | 0 | 4 | 5,800 | 479,975 | 271,633 |
| De Lier | 64,628 | 10 | 0 | 1 | 11 | 2 | 11 | 0 | 0 | 11 | 5,300 | 400,664 | 75,106 |
| Wassenaar | 13,023 | 4 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 4 | 4,100 | 342,310 | 173,215 |
| Ijsselmonde | 20,510 | 5 | 1⧗ | 0 | 6 | 0 | 5 | 0 | 0 | 5 | 3,100 | 168,235 | 11,057 |
| Zoetermeer | 13,317 | 3 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 3 | 3,150 | 71,540 | ..... |
| Ridderkerk | 16,153 | 4 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 2 | 3,100 & 4,900 | 35,501 | ..... |
| Berkel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 3,600 | 25,405 | 30,584 |
| Delft | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 3,800 | 11,426 | 21,180 |
| Alblasserdam | 5,413 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 4,800 | 10,852 | ..... |
| Moerkapelle | 13,369 | 2 | 0 | 1 | 3 | 0 | 0 | 2 | 0 | 2 | 2,450 | 4,902 | ..... |
| Monster | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 5,500 | 1,478 | ..... |
| Totals | 248,322 | 58 | 1 | 4† | 63 | 2 | 34 | 281 | 6 | 321 | ..... | 10,640,451 | 7,651,519 |

* Excludes natural gas producing wells.
† Includes one salt water disposal well.
‡ Crude oil horizons only.
⧗ Gas production at Ijsselmonde is from the Tertiary at 1,700 feet.

blasserdam, nine miles southeast of Rotterdam, 25.6-gravity crude was found at 4,800 feet in Neocomian (lower Cretaceous) sandstone. At Monster, four miles southwest of The Hague, 34.7-gravity oil was found at 5,500 feet in upper Barremian sandstone.

Of six wells completed last year in Ijsselmonde field, a 1956 discovery, five were completed as oil wells, and the sixth was completed as a gas well at 1,700 feet in Tertiary beds. Previously the Tertiary has been considered as an unprospective mantle in western Holland. De Lier field gained new importance with 10 new oil producers completed last year, one of which, located near Naalowijk, proved to be an important extension.

In the Schoonebeek field, three extension wells were completed, in addition to 21 inside locations and a salt water disposal well. An additional westerly extension found oil in a separate fault block. A deep test was drilled to the Zechstein (Permian) in Schoonebeek and was completed as a gas discovery.

**Gas Production.** No further development drilling was reported in the gas fields, centered in eastern Holland west of Schoonebeek at Coevorden, De Wijk and Wanneperveen. Natural gas production was reported to be rising rapidly.

**Pipe Lines.** Decision had been made to build a major international crude oil pipe line from Rotterdam to the West German Rhineland area, and a group of international oil companies, including Royal Dutch Shell, had formed Rotterdam-Rhine Pipe Line Company to build and operate the line. The port of Rotterdam also was being enlarged so it may accommodate larger supertankers in the future.

**Refining.** Work commenced Sept. 1, 1957, on a new 40,000 to 90,000 barrels daily refinery being built by Esso Nederland N V near Rotterdam for 1960 completion. The refinery was to cost $45.7 million.

At Pernis, Royal Dutch Shell increased throughput to almost 250,000 barrels daily in 1957.

**Crude oil reserves.** Reserves of crude oil were put at about 200 million barrels at the end of 1957.

# Spain . . . Presence of salt dome proved in Alava Province test drilled to 11,019 feet

SEVERAL ENCOURAGING events enhanced Spain's oil industry in 1957 and 1958. Some progress was made toward enactment of liberal oil legislation to encourage private capital, both foreign and domestic, to seek and produce oil in Spain and Spanish colonies. The presence of deep-seated salt domes was proven in Spain, and, together with other favorable geological conditions uncovered, it appeared only a matter of time before the nation joined the ranks of oil-producing countries. A new depth record was set, and Spain's refining capacity was increasing to fulfill the nation's oil products needs.

**New law.** Reportedly, the new oil bill was expected to be debated by the Spanish parliament this fall. In addition to other provisions, the proposed legislation would provide a 50-50 split of profits with oil concessionaires.

Several groups continued the oil search in Spain in 1957 and 1958, including:

• Valdebro, which is composed of Instituto Nacional de Industria (INI) and minority U. S. interests, including General American Oil Company and American Overseas Petroleum Ltd. Valdebro drilled five wells in 1957—all dry holes in Cadiz and Huelva provinces—and another test was being drilled at the end of December. The latter, Puerto de Ojen 1, about eight miles east of dry hole Almarchal 1, had reached 2,540 feet by the end of December. Valdebro operated two seismic crews in Spain during 1957. Plans were made to add an additional rig and a seismic crew to expand the oil search in Spain this year.

• **CIEPSA-Deilmann.** Compañia de Investigacion y Explotaciones Petroliferas S A continued wildcat drilling in northern Spain, with C. Deilmann Bergbau GmbH of Bentheim, West Germany, as a minority partner. In June, 1957, Laño 1, in Alava Province was abandoned at 11,019 feet in Triassic salt, gypsum and dolomite. According to the American Association of Petroleum Geologists *Bulletin*, this well proved the existance of a deep-seated salt dome. A few barrels of oil with salt water was swabbed from a Cenomanian sand after the well was plugged back for testing.

Shows of gas were also encountered in two other tests, Trevino 2 in Alava Province, and Alda 1 in Navarra.

# Portugal . . . Mobil Exploration continuing wildcat drilling program despite lack of success

OIL EXPLORATION continued in Portugal during 1957 and 1958 without tangible success at midyear. Mobil Exploration Portugal Inc. (a Socony Mobil affiliate), directs the oil search under an agreement with Companhia dos Petroleos de Portugal. The latter has as major stockholders the Portuguese government and Axel Johnson interests of Stockholm, Sweden.

One rig was being kept at work on wildcats. Barreiro 1, located four miles southeast of Lisbon, which was undergoing tests at the end of 1956, was abandoned in 1957 with total depth at 11,848 feet. The next test, Ramalhal 1, located 33 miles north and slightly west of Lisbon, was drilled to 11,552 feet in Dogger (Jurassic) beds, and abandoned. Another wildcat, Sao Mamede 1, located 60 miles north-northeast of Lisbon, was spudded late last year and had reached 770 feet by January, 1958, according to Socony Mobil Oil Company and the American Association of Petroleum Geologists *Bulletin*.

S. A. Concessionaria Da Refinicao de Petroleos En Portugal (Sacor) continued to operate the nation's only refinery at Cape Ruivo, Lisbon, with a capacity of about 30,000 barrels per day. Petrofina reported the lifting of several shipments from new oil fields in Angola, during 1957, presumably destined for the Sacor refinery. These shipments portend the fulfillment of the refinery's, and Portugal's, oil needs from Angola, anticipated within the next several years.

# Switzerland...

## Test well scheduled

DELIBERATE AND tangible strides were being made in Switzerland during 1957 and 1958 toward the discovery of oil and gas deposits that many geologists feel must be present in the Molasse Basin. No drilling was reported during 1957, but a test well was announced in May, 1958, to be drilled in Canton Vaud. The location is near Moudon and was to be drilled to 5,000 feet by Gewerkschaft Elwerath, a German company holding a half interest in the concession with Hydrocarbures S. A. of Lausanne.

Two previous wells drilled in Canton Vaud were at Cuarny and at Servion. The Cuarny test, located just southwest of Lake Neuchatel, was drilled to 7,293 feet in Dogger, with good oil shows reported in the Chattian between 1,300 and 1,640 feet. The Servion test, six miles northeast of Lausanne was drilled to 4,700 feet, far short of the Chattian (Molasse). The Moudon well was to be drilled on a reflection seismic prospect.

In November, 1957, the Swiss government circulated a Cantonal letter or *Kreisschreiben*, advising the Cantons that the federal government considers that it should supervise oil exploration and production activities, implemented by proposed amendment to the Federal Constitution. Cantons were requested to reply by May 31, 1958, with comments and suggestions. The government desires majority participation by Swiss interests in any oil exploration and development groups.

Schweizerische Erdol A G (SEAG) received its concession covering the four northeastern cantons of Zurich, St. Gallen, Argovie and Thurgovie on March 1, 1957. Surface mapping commenced shortly thereafter. A $300,000 reconnaisance reflection seismic program began April 1 and continued until December, 1957, largely in Canton Zurich.

Molasse Erdolforderungs A G (MOFAG) has majority ownership in Petromil S. A., which, in turn, has an exploration permit in northwestern Vaud, in the Jura. Photogeological work and surface mapping of the permit area was completed in 1957.

# Russia . . . Indicated crude production level of 2,197,000 barrels per day in 1957 exceeds goal

INFORMATION RECENTLY made available to the Free World in the form of statistical handbooks has shed new light on certain sectors of Russia's oil and gas industries. These data, augmented by articles in Soviet industrial newspapers and trade journals, enable the development of a better basic-year approach to estimation and evaluation of Soviet progress, claimed and planned.

The majority of data previously published by Russia was in the form of percentages. This required firm base-year data in order to estimate actual achievements. It has been necessary, therefore, in the past to go back as far as 1946 for factual data, and even to the prewar year of 1940. Even so, only a fragmentary picture could be realized.

The new information now available, after careful and objective evaluation, will enable the Free World petroleum industry to estimate the past and planned achievements of the Soviet petroleum industry and to evaluate this industrial development by comparison with the Free World petroleum industry.

**Crude oil production.** Successful fulfillment of planned crude oil production goals and the geographical shift in centers of production have been the distinguishing postwar features of the Soviet petroleum industry. Stalin in 1946 foresaw a goal in daily crude production of 1.2 million barrels by 1960.

This level of production was surpassed in early 1955, and actual production in that year reached 1.4 million barrels a day. The 1960 target of the Sixth Five-Year Plan (1956-1960)* has been set at 2.7 million barrels a day, or 91 percent more than 1955 production and 120 percent above Stalin's goal announced in 1946.

Fulfillment and over fulfillment of both the 1956 and 1957 goals for production of crude oil indicate that the 1960 target should be reached. Production in 1956 of about 609 million barrels—or 1,664,000 barrels daily—of crude oil was 11 million barrels—or 30,000 barrels a day—above plan. The 802 million barrels produced in 1957 (2,197,000 barrels a day) was about 7 million barrels (19,000 barrels daily) above plan. A goal of 853 million barrels has been set for 1958, tantamount to 2,337,000 barrels a day, which is equivalent to an increase of almost 14 percent over 1957. Continuation of this annual rate of rise through 1960 would allow the 1960 goal to be overfulfilled by almost

See Insert Map

**TABLE 1—Production of Crude Oil in the USSR by Union-Republic, 1950 and 1955-56 and Plans for 1960. By 1960, minor areas of production probably will contribute no more than 5 percent of Russia's total crude oil production.**

| AREA | 1950 | | 1955 | | 1956 | | 1960 (Plan) | |
|---|---|---|---|---|---|---|---|---|
| | Barrels (000's) | Percent of USSR Total | Barrels (000's) | Percent of USSR Total | Barrels (000's) | Percent of USSR Total | Barrels (000's) | Percent of USSR Total |
| USSR, Total* | 275 222 | 100 | 514,382 | 100 | 608,854 | 100 | 980,910 | 100 |
| By Republic: | | | | | | | | |
| Russian Socialist Soviet Republics | 132,466 | 48.2 | 357,945** | 69.6 | 445,413 | 73.12 | 787,479 | 80.3 |
| Ukranian SSR | 2,129 | 0.8 | 3,858 | 0.7 | 5.275 | 0.91 | 10,802 | 1.1 |
| Uzbek SSR | 9,751 | 3.5 | 7.237 | 1.4 | 7.477 | 1.22 | 10,855 | 1.1 |
| Kazakh SSR | 7,695 | 2.8 | 10,151 | 2.0 | 9,061 | 1.70 | 14,211 | 1.4 |
| Georgian SSR | 312 | 0.1 | 312 | 0.1 | 283 | 0.05 | n.a. | insg. |
| Azerbaidzhan SSR | 107 697 | 39.1 | 111,206 | 21.6 | 113,255 | 18.6 | 114,076 | 11.6 |
| Kirgiz SSR | 342 | 0.1 | 835 | 0.2 | 1,446 | 0.24 | 6,521 | .7 |
| Tadzhik SSR | 145 | 0.1 | 124 | insg. | 153 | insg. | n.a. | insg. |
| Turkmen SSR | 14,685 | 5.3 | 22,714 | 4.4 | 24,922 | 4.09 | 29,528 | 3.0 |

* Derived independently, and may not always agree with the sum of the rounded components.

** Crude oil production in the various regions with the RSFSR in 1955 may be broken down as follows (000s of barrels):

| | |
|---|---|
| North (Ukhta) | 3,996 |
| Center | 5,304 |
| Volga | 175,256 |
| N. Caucasus | 47,520 |
| Urals | 118,944 |
| Far East (Sakhalin) | 6,903 |

* While the Sixth Five-Year Plan per se has been scrapped, it appears that the 1960 goals for production of crude oil and gas have remained unchanged and will appear as such in the Seven-Year Plan, 1959-1965.

7 percent, or by 65 million barrels (178,000 barrels a day).

The geographical shift in centers of production has been well publicized. Table 1 shows the declining role of Azerbaidzhan, primarily the Baku oil fields, which once was the center of Russia's oil industry and which accounted for most of the prewar production. However, in 1956 Azerbaidzhan accounted for less than 19 percent of total Russian crude oil production. A further relative decline is anticipated,* for, according to plan, by 1960 Azerbaijan is to account for less than 12 percent of crude oil production in that year.

Concurrent with the decline of Azerbaidzhan has been the rise of the Urals-Volga area, or Second Baku. The Urals-Volga, which had a negligible prewar production, accounted for 58 percent of total national production in 1955. By 1960, the Urals-Volga is to account for 75 percent of total Russian crude oil production.

The relative importance of the remaining area of production outside the Urals-Volga area and Azerbaidzhan has lessened in the recent years, although actual production has risen somewhat. Table 1, which points up the concentration of production of crude oil in the Urals-Volga, indicates that the minor areas of production accounted for almost 13 percent of the crude output in 1950, less than 9 percent in 1955 and about 8 percent in 1956, despite an increase in aggregate production from 35.1 million barrels (96,000 barrels a day) to 50.2 million barrels (137,000 barrels a day) during this period. By 1960 these areas probably will not contribute more than 5 percent of total crude oil production.

Table 2 shows the significant factors reflecting the growth of the Soviet petroleum industry from 1951 through 1956. As shown by item 2, Table 2, Russia is having to go deeper to find new oil.

The average depth per well drilled in 1956 was about 38 percent greater than the 1951 average depth. The relationship of producing wells to total wells drilled has remained almost constant during this period—at a rate of 4 producing wells out of 10 wells drilled (Item 4). With total annual footage remaining at about the same level (Item 1) but with average well depths increasing, fewer wells were drilled.

For example, only 1,976 wells were drilled in 1956, or 13 percent less than the number drilled in 1951. However, the average yield from each new producing well has almost doubled during these six years, as shown in Item 11. Also, the amount of new oil for each foot drilled has risen from 2.7 barrels in 1951 to 4.05 barrels in 1956 (Item 10).

It may be noted that annual production from new oil wells during 1951-1956 totaled 341 million barrels (Item 7) while the absolute annual increases during this period total 333 million barrels (Item 6). In other words, the increase in crude oil production during the Fifth Five-Year Plan and the first year of the Sixth, appears to have been due almost exclusively to new oil production.

Further examination of available data shows this to be true only on the average, for during the years 1951-54, 42 million barrels of new crude offset declining production of older wells. A change in this pattern began in 1955, when production from new wells accounted for only about 90 percent of the absolute increase (Item 8). In 1956 new oil accounted for less than 72 percent of the absolute increase.

Rehabilitation of inactive wells and application of secondary recovery methods apparently are responsible for total annual increases currently exceeding the production from new wells, as shown in items 6 and 7 for 1955 and 1956.

**Crude oil production methods.** In 1955 flowing wells accounted for 58.3 percent of Russian crude oil production, compared to 32.5 percent in 1950. Conversely, crude oil produced by pumping wells declined from 44.7 percent in 1950 to 34 percent in 1955. Artificial life by compressors dropped from 21.1 percent of the total in 1950 to 6.5 percent in 1955 (See Table 3).

The average daily yield from each active well, which had declined from 70.9 barrels in 1936 to 39.3 barrels in 1951, began rising in 1952 and reached 51.1 barrels in 1955. The average daily yield per active well in 1955 ranged from 13.4 barrels in the Far East (Sakhalin) to 439 barrels in Tatar. For new wells only in 1955, the daily output per well ranged from 44.4 barrels in the Far East to 390 barrels in Tataria.** The Urals-Volga area averaged about 336 barrels per new well per day in 1955.

**Production of gas.** Indicative of the postwar progress of the Soviet gas industry was the underfulfillment of both the Fourth and Fifth Five-Year Plan production goals.

According to the directives of the Fourth Five-Year Plan (1946-50), production of natural gas in 1950 was to reach 297 billion cubic feet, and manufactured gas *** 67.1 billion cubic feet. Actual production of natural gas fell short of the goal by 26.5 percent and of manufactured gas by 78 percent in the Fourth Five-Year Plan. Production of all gases at the end of the Fifth Five-Year Plan in 1955 was 93 percent of the goal, and amounted to 367 billion cubic feet.

**TABLE 2—Significant Trends of Russian Petroleum Industry, 1951-1956. Russia is having to drill deeper for its oil on basis of development drilling figures.**

| ITEM | 1951 | 1952 | 1953 | 1945 | 1955 | 1956 |
|---|---|---|---|---|---|---|
| 1 Total footage drilled (000's of feet) | 15,443 | 16,092 | 17,592 | 16,307 | 16,443 | 16,657 |
| Development | 7,651 | 8,613 | 9,449 | 8,767 | 8,837 | 9,115 |
| Exploration | 7,792 | 7,479 | 8,143 | 7,540 | 7,606 | 7,542 |
| 2 Average depth per well drilled (in feet) (on basis of development drilling) | 3,350 | 3,776 | 4,157 | 3,901 | 4,124 | 4,610 |
| 3 No. of development well drilled | 2,282 | 2,412 | 2,272 | 2,247 | 2,202 | 1,976 |
| Producing wells (at time of accounting) | 971 | 886 | 991 | 945 | 1,000 | 840 |
| Idle and inactive (at time of accounting) | 1,311 | 1,526 | 1,281 | 1,302 | 1,202 | 1,136 |
| 4 Producing well as percent of total development wells drilled | 42.55 | 36.73 | 43.61 | 42.05 | 45.4 | 42.51 |
| 5 Total USSR production of crude oil (million barrels) | 306.6 | 343 | 383 | 430 | 514 | 609 |
| 6 Absolute yearly increase (million barrels) | 32 | 36.3 | 40 | 47.2 | 84.3 | 94.5 |
| 7 Production from new wells (million barrels) | 41.4 | 48.7 | 50.1 | 57.4 | 75.6 | 67.6 |
| 8 New oil as percent of absolute rise | 129.5 | 134.0 | 125.4 | 121.5 | 89.6 | 71.53 |
| 9 New oil as percent of annual production | 13.5 | 14.2 | 13.1 | 13.34 | 14.6 | 11.1 |
| 10 Barrels of new oil per each foot drilled | 2.7 | 3.0 | 2.86 | 3.54 | 4.56 | 4.05 |
| 11 Average yield from new producing wells metric tons/year | 5,868 | 7,560 | 6,960 | 8,352 | 10,392 | 11,076 |
| Barrels Daily | 117.3 | 151.2 | 139.2 | 167 | 207 | 221 |
| 12 No. of active wells, USSR total, at end of year | 21,440 | n.a. | n.a. | n.a. | 27,690 | 28,730 |
| 13 Average annual yield per well (tons) | 1,968 | n.a. | n.a. | n.a. | 2,556 | 2,916 |
| 14 Average daily yield per well (barrels) | 39.3 | n.a. | n.a. | n.a. | 51.1 | 58.3 |

* The possibility that this position may somewhat be strengthened is indicated by reports that production of crude oil in Azerbaijan in 1957 will surpass the level planned for 1960.

** An apparent anomaly in that new well production averages lower than that of all wells.

*** Reported by the USSR as that gas produced from shale and the underground gassification of coal, and does not include chemical coking plant gas, gas produced from peat and from other minor sources.

These plan shortcomings may be attributed to a negative position held by planners and to the postwar preeminence of the oil industry. The negative position resulted from two positions that later proved to be erroneous. The first was the opinion that natural gas should be consumed only in domestic cooking and space heating. The second was the Soviet geologists' statement that natural gas resources were quite small and that they would not support delivery of gas for other than domestic consumption.

However, the desire to shift Russia's fuel balance from one heavily in favor of coal to one in favor of liquid and gaseous fuels, plus recent discoveries of large gas reserves, has focused attention upon the need for allocating necessary resources to guarantee rapid development of the gas industry. The first major step, administratively, in this direction was to separate the gas industry from the oil industry. This occurred with the creation in September, 1956, to the Main Administration for the Gas Industry (Glavgaz), attached to the USSR Council of Ministers.

Production of natural gas in 1960 is to reach 2,000 billion cubic feet for an increase of more than 500 percent during the Sixth Five-Year Plan. Production of manufactured gas (from shale and the underground gassification of coal) is to increase by 150 percent during the Plan—from 49.4 billion cubic feet in 1955 to 124 billion cubic feet in 1960. Of the 124 billion cubic feet planned for 1960, 81.2 billion cubic feet will be derived from the underground gassification of coal, a significant increase over the estimated 1956 production of 17.7 billion cubic feet.

Recent reports indicate that Russia produced about 713.3 billion cubic feet of gas in 1957, or only 94 percent of the planned goal. Production of gas in 1958, therefore, may reflect this underfulfillment and should reach about 1,100 billion cubic feet as compared with 1,148 billion cubic feet originally planned (see Table 3). Conversely, other data point toward a planned goal of 1,766 billion cubic feet of gas in 1959, which, if achieved, would exceed the original goal by 11 percent.

**Drilling data.** The annual amount of drilling in the Russian petroleum industry* during the Fifth Five-Year Plan remained substantially unchanged (Item 1, Table 2). In 1951, the first year of the Plan, 15.4 million feet were drilled. Drilling in the last year of the Plan, 1955, reached 16.4 million feet, for an increase of only 6.5 percent. During this period 11,415 wells were drilled (Table 2, Item 3), for an average depth of 3,795 feet per well.

A total of 124.7 million feet is to be drilled during the Sixth Five-Year Plan. The annual volume of drilling is scheduled to rise considerably during the latter years of the Plan, from 18.6 million feet in 1957 to about 32.8 million feet in 1960.

Increases in drilling speeds, although below plan, were achieved during the period 1950-1956. During the Fifth Five-Year Plan, exploration drilling speeds increased by 46 percent and development drilling speeds by 42 percent.

Development drilling speed in 1956 was only 86 percent of plan, and exploration drilling speed was 96 percent of plan.

**Comparison of U.S.-USSR drilling speeds.** A popular Soviet oil worker's magazine recently published a comparison of the 1955 average distribution of time in USSR and U.S. drilling operations. The comparison indicates that an average of 1.5 hours was consumed in drilling 1 meter (3.281 feet) in the USSR in 1955, compared to .735 hours in the U.S.

In other words, the United States was getting almost double the amount of footage in a comparative time period. Yet, to drill that 1 meter, the Soviet bit, says the magazine, was on bottom only 9.6 minutes, or 10.67 percent of total calendar time per meter drilled, while the U.S. bit was on bottom 24.9 minutes per meter drilled, or 56.46 percent of total calendar time.

One principal reason for the low commercial drilling speeds in the USSR is the insufficient durability of bits, which tends to offset the effectiveness of high mechanical drilling speeds. The amount of time a Soviet bit is on bottom has been decreasing in the past several years. In 1950 the Soviet bit was on bottom an average of 18.6 percent of total calendar drilling time. This was reduced to 11.3 percent in 1954, and to 10.6 percent in 1955.

**Role of the turbodrill.** Much of the success of the Soviet petroleum industry in meeting planned crude oil production goals may be attributed to the turbodrill. Use of the turbodrill has been particularly advantageous in the hard-rock formations of the Urals-Volga.

Application of the turbodrill in the major producing areas of the Urals-Volga has risen from an insignificant percentage of total drilling in 1940 to an average of over 97 percent in 1955. Concomitantly, the production of crude oil in the Urals-Volga has risen from 6 percent of total USSR production in 1940, to 29 percent in 1950, and to 58 percent in 1955.

In 1950 the turbodrill accounted for 23 percent of all drilling in Russia. By 1955 this percentage had risen

**TABLE 4—USSR Trunk Oil and Gas Pipe Line System, Completed and Planned, 1950-60**

(Thousand miles)

| YEAR | Construction | YEAR-END AVAILABILITY | | |
|---|---|---|---|---|
| | | Total* | OF WHICH: Oil | Gas |
| 1950 | .6 | 5.2 | 3.3 | 1.9 |
| 1951 | .5 | 5.7 | 3.7 | 2.0 |
| 1952 | .7 | 6.4 | 3.8 | 2.6 |
| 1953 | 1.0 | 7.4 | 4.4 | 3.0 |
| 1954 | 1.2 | 8.6 | 5.0 | 3.6 |
| 1955 | 1.4 | 10.0 | 6.4 | 3.6 |
| 1956 | 1.7 | 11.8 | 7.2 | 4.6 |
| 1957** | 2.6 | 14.4 | 8.3 | 6.1 |
| 1958** | 2.8 | 17.2 | 9.6 | 7.7 |
| 1959** | 3.9 | 21.1 | 11.1 | 10.1 |
| 1960** | 4.8 | 25.9 | 12.9 | 12.9 |

* Derived independently and may not always agree with the sum of the rounded components.
** Plan.

**TABLE 3—Estimated* and Planned Production of Gas in the USSR During the Sixth Five-Year Plan, and Tentative Goal for 1965**

(Billion cubic feet)

| | 1956 | 1957 | 1958 | 1959 | 1960 Original | 1960 Revised | 1965 |
|---|---|---|---|---|---|---|---|
| Total, all gasses | 484.6 | 755.7 | 1,148 | 1,589 | 1,413 | 2,119 | 4,591 |
| Natural gas | 425.8 | 688.6 | (1,059) | (1,483) | 1,271—1,307 | 1,995 | (4,238) |
| Gas manufactured from coal and shale | 58.8 | 67.1 | (89) | (106) | 106—141 | 124 | (353) |

* Figures in parentheses are estimates based upon examination of available information. All others represent reported achievements and/or goals.

*For both oil and gas, prior to the creation of Glavgaz in September, 1956.

to 83.5 percent and to 87.6 percent in 1956. Use of the turbodrill in development drilling is slightly higher than in explorational drilling.

**Pipe lines.** In conjunction with Russia's long-range goals for production of oil and gas, the Soviet press has indicated that a rapid growth in the installation of trunk oil and gas pipe lines also is planned (see Table 4).

During the next 10-15 years, construction of trunk oil pipe lines is expected by Russia to total 24,800 miles, and the entire network is to reach about 31,000 miles.

Construction of about 18,800 miles of trunk gas pipe lines is planned for 1961-65, or double the amount planned for the preceding five years, and about five times the total availability of trunk gas pipe lines at the end of 1955. Total construction of trunk gas pipe lines for the Seven-Year Plan, 1959-65, is scheduled to reach about 24,800 miles.

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# East Germany . . . 1958 crude output of 64,000 barrels called for by government quota

APPARENTLY, East Germany's lack of intense interest in oil exploration has ended. With crude production in 1957 amounting to only approximately 32,000 barrels, or an average of less than 88 barrels per day, the East Berlin government last year made earnest efforts to organize the oil industry on a state owned and managed basis. Also, an effort was made to allocate sufficient funds for exploration activities.

With two new producing wells at undisclosed sites, the Fallstein (Harz) area apparently remained the major producing area.

Total natural gas yield in 1957 reportedly amounted to 883 MMcf.

**Production plans.** As with other Soviet satellites, information about production plans in East Germany is difficult to obtain. Where reports have been received, often they conflict or are vague.

However, the government has planned for 1958 crude production of 64,000 barrels for an average rate of 175 barrels daily and for 1.2 billion cubic feet of natural gas to be produced.

Long-range planning reports are in conflict. Professor E. Lange of the State Geological Commission set the oil and gas quotas for 1960 at 606,000 barrels (1,655 barrels per day) and 2.1 billion cubic feet, respectively.

K. Neumann, also of the geological commission, revealed the more modest oil output goal of 499,000 barrels (1,363 barrels per day), with the same 2.1 billion cubic foot natural gas objective.

Deputy Prime Minister Fritz Selbmann, in an official statement, described the anticipated oil production trend as follows:

- 1958—64,000 barrels plus, or about 175 barrels daily.
- 1959—289,000 barrels, or 800 barrels daily.
- 1960—574,000 barrels, or 1568 barrels daily.

**Drilling.** During the current year, East Germany expects to complete 219,450 feet of exploratory drilling. No development drilling figures were released. That compares favorably with the 161,205 feet of hole drilled in exploratory operations during the previous year.

However, in 1959 exploratory and development drilling is expected to reach the 347,000-foot range, with the former category furnishing more than 307,000 feet. By 1960, the total is expected to rise to 501,000 feet of which 382,000 feet would be credited to exploratory activities.

Major drilling sites will be West and East Mecklenburg Province, the Altmark area, South and North Brandenburg, and the Thuringian district of Muehlhausen.

Total wells drilled since 1949 number 89, of which three showed oil traces—two in the Fallstein (Harz) area and one in the Langensalza gas region.

# Czechoslovakia . . . Crude yield decreases; government denounced for lack of support

DECREASING CRUDE production and increasing natural gas output were the major trends recorded by Czechoslovakia's petroleum industry during 1957. While production reports from Czechoslovakia are conflicting because the government refers only to percentages, the most authoritative evaluation puts last year's crude output at about 672,800 barrels, or a daily average of 1,843 barrels. Thus, the downward trend is reflected by comparison with annual production of 1.2 million barrels (3,278 barrels daily) in 1956, 1.1 million barrels (3,000 barrels daily) in 1955 and 1954, and 900,000 barrels (2,465 barrels a day) in 1953.

Natural gas production, on the other hand, is believed to have increased annually since 1955, reaching 10.5 billion cubic feet last year.

Since the nation's domestic crude output supplies only slightly more than 10 percent of total requirements of about 6.6 million barrels annually, most of the demand was supplied by imported crude and by synthetic oil plants in northern Bohemia.

Last year, Slovakia reported a 9 percent rise in crude production, reaching a daily average of 1,161 barrels, but Moravia and Bohemia provinces fell behind government quotas.

In Slovakia, Czechs concentrated on drilling wells near the Austrian border to reach the Zwerndorf gas field horizon, which straddles the border. In the meantime, the Slovak oil and gas monopoly shut in the inland wells, apparently for later use. A total of 150 wells reportedly were producing oil and gas at year's end.

Pipe lines are coming into importance now that natural gas has become increasingly important. One pipe line was scheduled to be constructed between the Liskivec gas field and the neighboring Stalingrad Iron Works. Later, Tyrnau field gas will be transported through a projected pipe line to Brno.

**Exploration.** Czech exploration experts have been publicly denouncing the government for not furnishing exploratory activities with sufficient funds. They feel that operations are necessary at Malacki, Gbely, Brno, in western Slovakia and Southern Moravia.

Prospective areas have been reported in northwest Slovakia, near Frenchstadt, in Ostrava district, Sillein, Proprad, Tursowka and Cadece districts. Promising areas in eastern Slovakia have been listed as Presow district and the villages of Badeiov, Svidnik, Mikov, Zborov and Radvani. It is reportedly felt that any of these areas may become Czechoslovakia's major crude producing area of the future.

The combined geological operation was allotted $123 million in 1956 as compared with $117,200,000 in the previous year. Geological parties have accepted a number of Egyptian trainees for long period. The total number engaged in exploration activities amounts to approximately 3,000 of which 800 are graduate personnel.

**Reserves.** Crude oil reserves in Czechoslovakia currently are estimated at about 20 million barrels, of which 14 million barrels are credited to the area in and around Gbely.

**International activity.** The awarding of a refinery contract in Damascus, Syria, made headlines in 1957. Less publicized were Czech dealings with Egypt (oil storage tanks), with India (line pipe) and with Argentina (line pipe).

Czechoslovakia remains dependent upon oil imports to supply domestic requirements. However, domestic refining capacity is believed sufficient to fulfill demand for products.

**Refining.** Refining capacity at year's end was estimated at almost 4 million barrels, most of which is furnished by the old Bratislava refinery and the Pardubice plant.

# Albania . . . Smallest satellite credited with largest percentage gain in crude production

ALBANIA, THE smallest of the European Soviet satellite countries, in 1957 recorded the largest crude production increase in the satellite bloc. The nation produced 3,267,612 barrels, for a daily average of almost 9,000 barrels, last year—69 percent above the (unofficial) 1956 output of 1,934,880 barrels, which was equivalent to a daily producing rate of 5,300 barrels.

This rate of production puts Albania, along with Bulgaria, into the ranks of the more important Eastern Bloc oil producers. The singularly favorable location of Albania as an outpost for Russia and its dangerously isolated location from the rest of the satellite countries are major reasons for Russian aid.

Growing use of Albania's natural wealth thus far has not benefited its people directly. However, the nation is expected to strive hard for a higher standard of living than sister satellite nations enjoy. If the effort succeeds, with Russian assistance, the Soviets may point in the next decade to Albania as an example of the "Socialistic economic concept."

As a result of the 1957 crude production level, the government raised its plans for 1960. Instead of the originally scheduled 1960 oil output of about 3.3 million barrels, or slightly more than 9,000 barrels a day, Albania's oil industry will have a quota of more than 13.3 million barrels, or 36,500 barrels daily. That is 300 percent greater than the 1957 producing level.

Production for 1958 has been set at 3.8 million barrels, or about 10,500 barrels per day.

Thus it is that oil has become Albania's major means of paying for imports geared to convert the nation from an agricultural country into a small, power-packed industrial output of the Soviet's Mediterranean (Adriatic Sea) front. If the 1960 objective is reached—36,500 barrels daily—Albania will move into third position within the East Bloc oil producing circle, following Russia and Rumania and ranging slightly higher than Hungary but well above the remaining satellites.

**Exploration.** Joint Albania-Soviet exploratory operations were centered last year at Mueyekie lowlands in the southern part. Long-range state plans demand that geophysical activities in eight undisclosed districts be completed by 1960 and that all preparatory work in 20 other districts be

completed so geophysical studies may begin that year.

In September, 1957, Radio Tirana said "five new major oil deposits were found in this year, these deposits to be the backbone for the contemplated steep production increase of the coming years."

Principal 1958 discovery (up to August 1) was in Malinosa.

**Natural gas, refining.** Natural gas production of 1957, which was 300 percent above the previous year, according to Albania, resulted in the planning of a 10-year program aimed at supplying Albania's entire industrial area with this fuel. Initial areas designated to be furnished natural gas were Vlona and Fieri.

Radio Tirana on March 18, 1957, claimed that the No. 2 refinery at Stalin City had been put on stream. Built at a cost of $600,000, the claimed annual throughput capacity is 1 million barrels—equal to the capacity of the Cerrick refinery completed the previous year.

**Exports.** Albania's 1957 crude imports are believed to have reached a record height of slightly more than 2 million barrels, or a rate of about 5,500 barrels a day. In 1950, exports were put at 800,000 barrels, or a daily rate of almost 2,200 barrels.

**Russian aid.** Last year, the oil industry received substantial assistance from Russia, including one $4 million dollar credit and one $105,500,000 gift.

The commercial credit reportedly provided for 24 drilling rigs, pipe, dredges and other equipment. A large part of the gift was in the form of geological gear, the delegation of Soviet specialists to Albania, the training of Albanians, in addition to geological equipment.

During the 1955-1957 period, Russia reportedly increased its exports to Albania by 87 percent and participated in 1957 with 57.4 percent of total Albanian imports, which points to Russia's dominance over its satellite.

# Bulgaria . . . Production rises despite transportation, storage bottlenecks

SINCE THE discovery of Bulgaria's first commercial crude oil production in 1955, the industry had produced slightly more than 4.5 million barrels (to Jan. 1, 1958) from the Black Sea field and from offshore wells. Oil production in 1957, estimated at slightly more than 1.8 million barrels, or a daily average of almost 5,100 barrels, reflected an increase from 1956. During the previous year, production was put at 1.6 million barrels, which was tantamount to a daily average rate of almost 4,500 barrels. The latter figure is a revised total based on information made available to WORLD OIL this year.

But while crude production has risen, Bulgaria has been experiencing unexpected and severe bottlenecks in transportation, storage and refining. So all but about 310,000 barrels of its crude was exported. Practically all of the exported oil went to other Russian satellite nations.

**Drilling.** Up to mid-1957, Bulgaria was forced to use old rotary equipment. Russia, at that time, shipped to Bulgaria its first turbine rig.

By mid-1957, 158 wells had been completed, of which 106 were successful. Depths of these wells range from 1,181 feet to 1,212 feet, except for Well R-40, which was scheduled to be drilled to 10,000 feet.

Shabla, a village on the Black Sea shore in Dobruga province, lies at the western end of the field which centers around Tjulenovo. (Note: WORLD OIL was the only publication which five years ago announced the exact location of this then potential field—a location which now is proven by official reports).

Unofficial Bulgarian reports indicate that oil production will not be accelerated until adequate storage, transportation and refining capacities have been established. This may point toward possible greater production, especially in view of the faster drilling Russian turbine rigs which are being imported in increasing numbers.

**Pipe lines.** The crude oil pipe line from Dobruga field to Kasarna has been given top priority. While the length of this project has not been disclosed, reports have been made that no pumping equipment will be needed. The crude will flow by gravity over the 396-foot drop.

**Refining.** Increased production has emphasized the growing need for refinery capacity. Existing Varna and Russe refineries, which have a total annual capacity of about 316,000 barrels, were to have been expanded last year.

**Imports and exports.** While exploration operations continue in Tjulenovoa, in Baltshik district, Bulgaria still remains in need of Rumanian oil products. However, Bulgaria is exporting crude oil to Italy, Hungary and Poland and Austria.

Because of its imports, Bulgaria's foreign trade deficit for 1956 and 1957 totaled $56 million. For that reason, the Sofia government will increase allocations for 1958 exploration by 50 percent from the previous year.

# Hungary . . . Drop in 1957 crude production to 14,000 barrels a day causes government to cut 1958 quota

HUNGARY IS proof that political doctrine cannot really influence crude production. Daily average crude production in 1955 of slightly more than 32,000 barrels lent hopes that 1956's output would increase. Consequently, the state planners ordered a producing rate of slightly more than 36,000 barrels a day for 1956.

But during that year, the major producing oil field Nagylengyel experienced a serious decline. Instead of fulfilling the 36,000-barrel-a-day quota imposed on the industry for 1956, crude production slipped to less than 21,000 barrels daily.

The hasty, forced development of Hungarian oil fields by Soviet technicians still was being felt in 1957, when crude production amounted to only 14,000 barrels per day. The decline was so marked that even the state planners cut their plans sharply for 1958—to only about 17,500 barrels per day.

Latest information from Budapest,

however, indicated that the 1958 goal had been increased to slightly more than 20,000 barrels per day. The original 1958 quota called for a daily average yield of about 17,500 barrels, about 3,500 barrels a day greater than during the previous year.

This new goal was to be achieved both by increasing Nagylengyel production and by the drilling of 23 new wells. The number of Hungary's producing wells had increased from 370 at the beginning of 1951 to 510 at the beginning of this year. Most of the wells were drilled by Russian rotary rigs; however, a few Russian turbines had been delivered by early 1957. One of the latter drilled what Hungarians claim as the Central European depth record—Well 363, which was drilled to 13,276 feet. Two additional turbine rigs were scheduled to be delivered in Zala County in March, 1958.

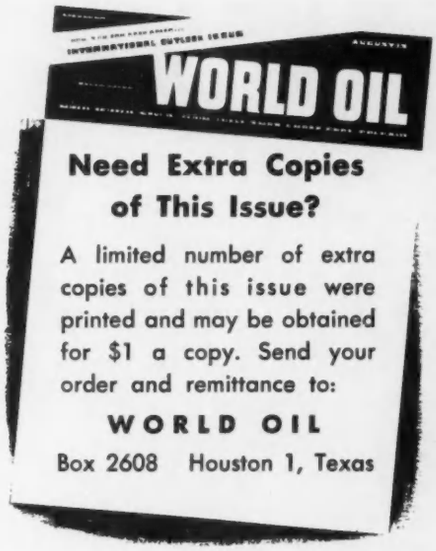
Currently, the 70 oil wells at Nagylengyel are producing about 9,100 barrels a day. The initial wells were completed in 1951 with average producing rates of almost 2,000 barrels a day. Total producing wells in Zala oil field number 116.

**Exploration.** Hungary's oil and gas is produced from 15 deposits, of which 13 have been post-World War II discoveries—Exploration, conducted with domestically-produced equipment, is centered at Zala, the Nagylengyel field and in the trans-Danubian basin. Zala County administration received a reported $18.1 million last year in a move directed toward the acceleration of exploration programs.

New deposits and fields reflect the result of successful exploration:

- Oil has been discovered north of the Nagylengyel field.
- Oil traces have been found along the Theiss River, at Nagy-Koeroes, at Lovasz and Bazakerettye.
- A major oil field has been found at Bajcsa from which a daily average production of 2,600 barrels was expected this year.
- Natural gas has been discovered at Totkomlos, in Bajcsa, Szolnok and Toertel.

**Imports.** Hungary's crude oil imports are furnished by Russia. These imports are increasing sharply, with the 1957 level of crude imports exceeding the 1955 range by 35 percent. The over-all 1958 foreign trade plan calls for a reduction of imports by 12 percent, as compared with the previous year, and an export expansion of 22 percent.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In an attempt to span the gap between exports and high imports, which last year amounted to a deficit of $1.7 million and was covered by Russian credits, Hungary offered Poland oil products and Argentina $500,000 worth of drilling equipment.

**Refining.** Hungary's refinery throughput last year reportedly reached a record level of 12.9 million barrels, or about 35,500 barrels daily.

**Pipe lines.** The Nagylengyel-Devecser oil pipe line was scheduled to be completed about mid-1958, and the pipe line from Totokomlos to Groshaza was under construction.

Meanwhile, construction was continuing on the joint Hungarian-Rumanian natural gas pipe line which will connect the Transylvanian gas fields with industries in Tisza-Videk and Dioesgyoer in Hungary.

## Rumania . . . Producing industry barely able to hold its own due to depletion of older oil fields

RUMANIA'S oil industry is in a period of stagnation. Production increases in newly-developed fields are barely able to compensate for depletion in older fields. As a result, the 1956 rate of production of 222,368 barrels per day, or 81.3 million barrels for the year, was increased last year to slightly more than a daily average of 224,600 barrels, or 81.9 million barrels annually.

Natural gas production, which was reported at 137.7 billion cubic feet in 1955, was estimated at 162.4 billion cubic feet last year.

Russia, vitally interested in Rumania's oil industry in which it shared jointly for the first six postwar years, has promised delivery of more drilling equipment, money and technical assistance in an effort to bolster the industry.

**Drilling.** Footage drilled in 1957 was 6.4 percent short of the prescribed quota even though it was an improvement of 4.6 percent from 1956, when the annual figure amounted to 2,741,420 feet.

**Production.** The 1960 quota calls for production of 100,615,500 barrels, or a daily average rate of 274,957 barrels. The quota also prescribes an annual increase from 1958 to 1960 of about 15,000 barrels in daily average output.

To achieve this, secondary recovery practices are being expanded in the older fields, i.e., Boldesti.

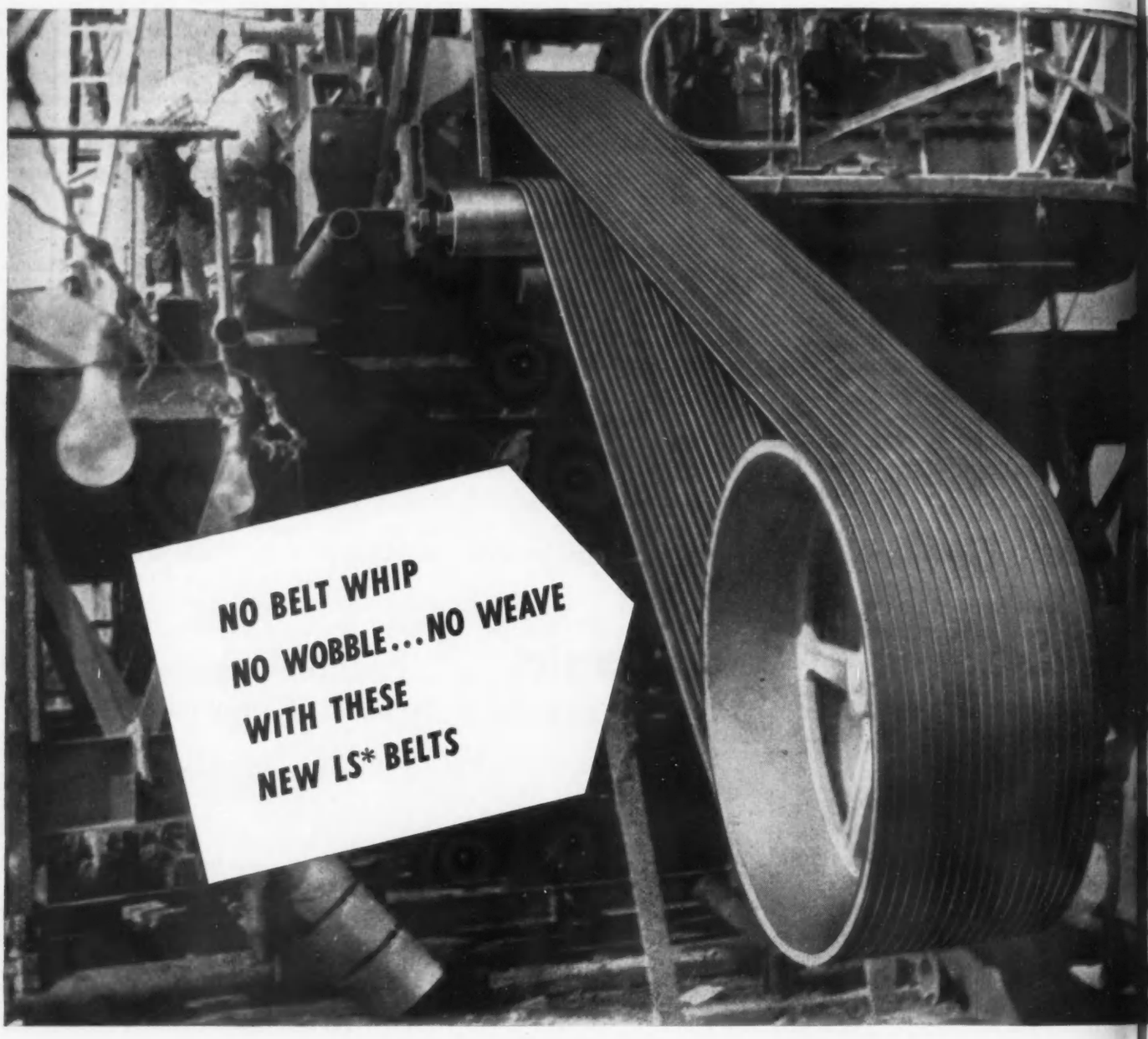
Rumania's current production stems from about 4,000 wells (1957) as compared with 2,200 wells reported in 1950.

**Exploration.** Moldovia's rapid rise to oil producing prominence has caused additional exploration parties to be sent into the area in an effort to study the northern area. Exploration operations were under way also at Pitesti, Valea Caselor, Babeni and in the South Carpathian district.

New fields reportedly were discovered near Craiova. Seven wells had been drilled there by the beginning of 1957, and five more were scheduled to be completed last year.

Oil also was found in southern Morovia, near Valeni, at depths of between 1,000 feet and 1,640 feet; at Trotush, in Trotush Valley; and at Babeni, 19 miles south of Rimnicu Valea City, where almost 66,000 feet of hole was drilled last year.

**Pipe lines.** Rumania's 1957 pipe line construction program called for the laying of a 400-mile pipe line from

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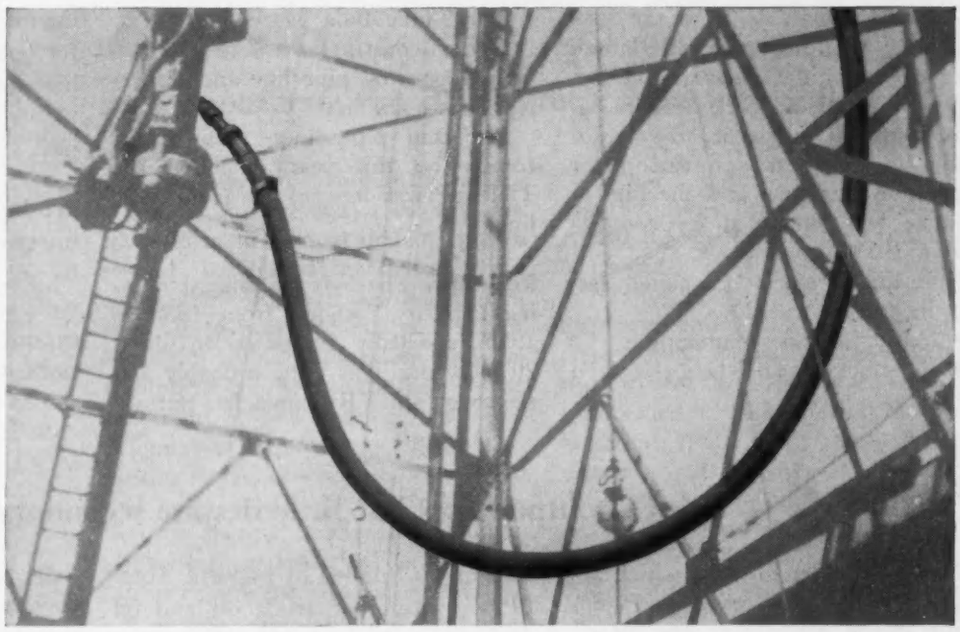

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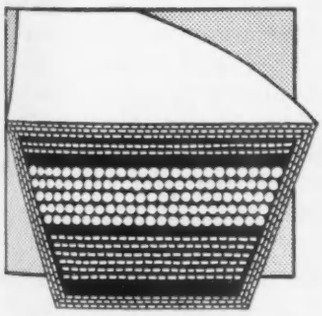

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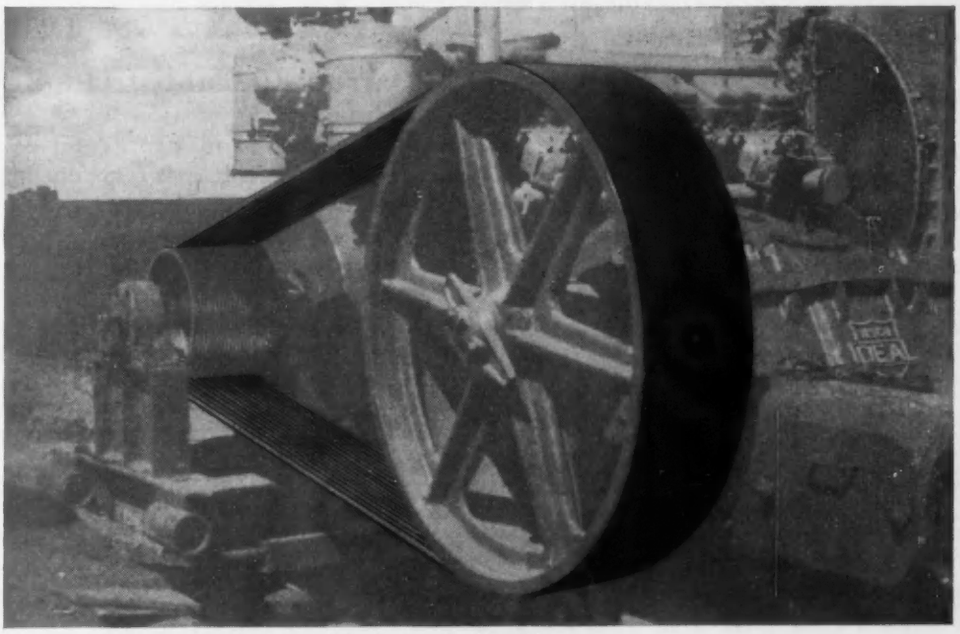

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the Transylvanian fields to the steel center of Hunedoara, with lateral lines to Arad and Temesvar. The section from the fields to Hunedoara began operating last year, the Arad-Temesvar link was scheduled for completion this year and the line to Reshitsa was scheduled for completion in 1959.

Pipe line projects completed last year include:

- 11.8-mile Nades-Fintele line.
- 26.7-mile Poiana-Laculi-Saru line.
- 109-mile Baia Mare line.

Under construction were the Babeni-Govora oil pipe line and Nades-Noul Sasec gas line.

Projected pipe lines, planned for completion this year, included the Ticleni-Parosi natural gas trunk pipe line.

**Refining.** The average annual refining capacity increase from 1950 to 1955 reportedly amounted to about 20 percent. This rate probably has slackened since Rumania has not announced any over-all refining figures for more recent years. However, it has been established that several plants went into operation during the past year and early in 1958.

**Trade.** Rumania does not report on international trade figures. Most of its oil undoubtedly goes to Russia, with much of the remainder being exported to other Eastern Bloc nations. Only a trickle finds its way to the West.

# Poland . . . Oil output rises but little despite secondary recovery efforts

THE KARPATHY oil firm, which accounts for almost all of Poland's domestic crude production and which is headquartered in Krosno, reported a daily average producing rate for 1957 of almost 3,700 barrels, about 50 barrels daily less than during the previous year. The company's natural gas yield amounted to a reported 14.7 billion cubic feet, down slightly from the more than 15.3 billion cubic feet claimed for 1956.

Decreasing production occurred last year despite the widening use of secondary recovery practices. Crude output this year, it is anticipated, will experience a further decline—to a daily average rate of about 3,400 barrels. Natural gas is expected to record a paralleling decline—to a total of 12.7 billion cubic feet for the year.

Most of the country's demand for crude oil and products—almost 90 percent—is fulfilled by imports. Total 1957 imports of crude oil and oil products amounted to $58 million dollars.

**Exploration.** Twenty-five geophysical parties operate in Poland. The number of seismic field parties increased from six in 1956 to 21 last year. These parties operate in Upper Silesia province (formerly Germany) and Poznan province, where geological conditions reportedly are similar to those in Hanover, in West Germany. Some exploration work also is being conducted in Pommerania and the Carpathian mountains.

**Latest discovery.** Jaslo is the site of Poland's latest oil discovery. A wildcat completed in June, 1957, initially produced at a daily rate of 52 barrels of paraffin-base crude. Ten additional wells were ordered to be drilled immediately.

**1957 Drilling Activity in Poland**
**(In Feet)**

| Company | DRILLING CLASSIFICATION | | | |
|---|---|---|---|---|
| | Exploration | Geological | Development | Total |
| Przedsiebiorstwo Geologiczno Wiertniczy Przemyslu Naftowego | 73,299 | 29,591 | 41,421 | 144,311 |
| PGWPN—Polnoc | 51,107 | 43,047 | 662 | 94,816 |
| Karpathy | ..... | ..... | 30,069 | 30,069 |
| Total | 124,406 | 72,638 | 72,152 | 269,196 |

**1957 Refining Operations in Poland**
**(In Barrels)**

| Refinery | Daily Average Throughput | Total for Year |
|---|---|---|
| Jedlicze | 2,757 | 1,005,905 |
| Jaslo | 3,379 | 1,233,579 |
| Glinik Mariampolski | 1,804 | 658,399 |
| Trzebinia | 5,989 | 2,186,062 |
| Czechowice | 1,219 | 445,191 |
| Total | 15,148 | 5,529,136 |

# Yugoslavia . . . Daily average oil yield rises to 7,281 barrels; 15,650-barrel-a-day level foreseen by 1961

YUGOSLAVIA'S CRUDE production rose last year to 2,665,065 barrels for a daily average of 7,281 barrels. Crude output for 1956 (revised) amounted to 1,982,112 barrels, or a daily average of slightly more than 5,400 barrels. The increase resulted primarily from the new Jermenovice field. By 1961, it is hoped that crude production will increase to an annual level of 5,727,093 barrels, or about 15,650 barrels daily.

Thus, Yugoslavia in 1961 will be able to supply about 50 percent of its crude requirements from domestic production. Demand in 1961 is expected to reach almost 30,000 barrels per day.

Selnica and Peklenica fields are almost depleted after a half century of production. The Gojlo field, discovered in 1939, currently is producing 135 barrels per day. Sumecani field producers, numbering 75, are accounting for almost 1,500 barrels of oil daily, and Mramor Brod is producing slightly more than 1,000 barrels per day from 33 producing wells.

As an extension to Mramor Brod, the Bunjani oil field currently is producing at a rate of about 800 barrels per day. Located on the western side of the Kriz-Sumecani structure, Klostar-Ivencic is producing about 2,400 barrels daily from 63 wells. Dugo Selo, which was put into production in January, 1957, now has 16 wells in operation.

Croatia has initiated a 10-year plan which calls for 1962 crude production

**Yugoslavian Crude Production, 1955-1957**
**(Revised)**
**(In Barrels)**

| Province | Year 1957 | Daily 1957 | Year 1956 | Year 1955 |
|---|---|---|---|---|
| Croatia | 2,117,047 | 5,785 | 1,682,424 | 1,441,964 |
| Slovenia | 271,309 | 741 | 258,351 | 293,912 |
| Serbia | 276,709 | 755 | 41,337 | None |
| Total | 2,665,065 | 7,281 | 1,982,112 | 1,735,876 |

of 3.3 million barrels annually, or more than 9,000 barrels a day. Exploration projects under the program call for activities in the Resnik area (near Agram), in Vrbovec-Slatina (near Kutina), in Agram-Brod (Moslavina and Psunj mountains), in Martinovska-Ves and in Sesvete.

Natural gas is being produced in the Croatian areas of Gojlo, Mramor Brod, Klostar Ivancic and, since 1957, Janja-Lipa. One natural gas pipe line connects Klostar Ivancic with Agram, and another, currently under construction, will connect Janja-Lipa and Agram, with a lateral line to Sisak.

**New field.** A new oil field reportedly has been developed by the German firm. W. Thiele Company, of Celle. It is located in Filovci, in the northwest area of Prekmurija district. Six deep holes have been drilled there, although no regular production had begun.

Serbia's 1957 crude production amounted to a total of 276,709 barrels, as compared with only 41,955 barrels during the previous year.

In Slovenia, gravimetric activities covering 435 square miles have been scheduled. The Morava Basin and the area along the Sasilovac River toward the Rumanian border have been the centers of activity. Other exploration areas include the northwest area of the old Selnica-Peclenica oil field; Slatina-Radenci; Hrast-Mota; and Novo-Mesto, southeast of Ljubjana.

Two fields discovered in recent years are expected to reach a producing level of slightly more than 335,000 barrels. They are Dugo Selo, east of Zagreb, where 12 wells were in production, and Jeremnovci, northeast of Belgrade. Koprivnica field, in northern Croatia, was scheduled to go into production this year. It was discovered in May, 1957.

**Natural gas.** Yugoslavia's 1957 natural gas output reached 3.5 billion cubic feet as compared with 3.2 billion cubic feet produced in 1956.

**Refining.** Yugoslavia's 1958 refining program calls for a capacity of 7.2 million barrels for the nation's three plants. In 1957, 2,277,669 barrels of domestic crude was processed, as compared to 2,079,117 barrels in 1956 and 1,765,606 barrels in 1955.

# Algeria . . . Discoveries of major oil and gas reserves continue; full development faces political obstacles

COMPANIES operating in the Sahara continued to find major oil and gas fields through wildcat drilling and to extend previous discoveries found since 1955 through completion of stepouts to prove up major reserves. Obstacles to oil exploration and development in the Sahara were being overcome by new seismic techniques designed to overcome the dissipation of shock-wave energy in loose sand and gravel and improved interpretation of seismic gravity and surface and subsurface geological data through longer experience.

However, international and domestic politics cast shadows on Algeria, for all the new fields would require long pipe lines for the oil and gas to reach markets, and these lines would be vulnerable to sabotage. Rebel forces remained determined to stop shipments of Algerian oil to France.

**Production.** Crude oil production in 1957 amounted to 186,694 barrels, an average of 512 barrels daily, a 21.6 percent decrease from the 653 barrels daily rate of 1956. Production from the old Oued Gueterini field, operated by Compagnie Algerienne de Recherche et d'Exploitation Petrolieres (CAREP), averaged only 310 barrels daily during 1957, less than half the 1956 rate. The field was producing little more than 100 barrels daily in December. Production of 73,654 barrels from Edjele and Tiguentourine fields in the extreme eastern Sahara during 1957 by Compagnie de Recherches et D'Exploitation de Petrole au Sahara (CREPS) for local use in diesel engines was reported, but other companies did not record figures for possible similar use of crudes.

**Exploration.** Four oil wells were completed in the Hassi-Messaoud area during 1957, and four more were being drilled at the end of the year. Early in 1958, there were six producers: wells Md 1, 2, 3 and 4, drilled by Societe Nationale de Recherches et d'Exploitation des Petroles en Algerie (SN REPAL), and Om 1 and 7, drilled by Compagnie Francaise de Petroles (Algerie) (CFPA).

Md 5 was being drilled, with five-mile stepouts to the southwest, south and southeast staked at Md 6, 7 and 8 respectively. CFP (A) was drilling Om 6, a five-mile east stepout, and Om 8, five miles north of known production.

Wells completed thus far have described a continuous productive area which covers a minimum of 50 square miles, or 32,000 acres. Though additional five-mile stepouts had been staked to the east and west, Hassi-Messaoud has entered the development stage.

CFP (A) completed its first test in midyear at Ouargla 1 (Om 1). The top of the pay sand was found at 10,735 feet, about 200 feet higher than in Hassi-Messaoud 1 (Md 1) five miles to the south. Om 1 encountered almost 700 feet of pay sand before encountering some water at about 11,400 feet. This, however, may indicate a water drive, which would be important to the ultimate recovery of the field. Furthermore, the field

**Production and Drilling in Algeria in 1957**

| Name of Company | Crude Production In 1957 In Barrels | Barrels Daily In 1957 | WELLS COMPLETED | | | | Footage Drilled In 1957 |
|---|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total | |
| Compagnie Algerienne de Recherche et D'Exploitation Petrolieres (CAREP) | 113,040 | 310 | 0 | 0 | 0 | 0 | 0 |
| Compagnie de Recherches et D'Exploitation de Petrole au Sahara (CREPS) | 73,654 | 202 | 10 | 14 | 8 | 32 | 149,708 |
| Compagnie des Petroles d'Algerie(CPA) | 0 | 0 | 0 | 2 | 6 | 8 | 59,924 |
| Compagnie Francaise des Petroles (Algerie) (CFPA) | 0 | 0 | 2 | 0 | 7 | 9 | 79,281 |
| Societe Nationale de Recherches et D'Exploitation des Petroles en Algerie (SN REPAL) | 0 | 0 | 3 | 3 | 2 | 8 | 114,457 |
| Compagnie d'Exploration Petroliere (CEP) | 0 | 0 | 0 | 0 | 1 | 1 | 3,281* |
| Total | 186,694 | 512 | 15 | 19 | 24 | 58 | 406,651 |

* Excludes stratigraphic drilling in Kahal Tabelbala.

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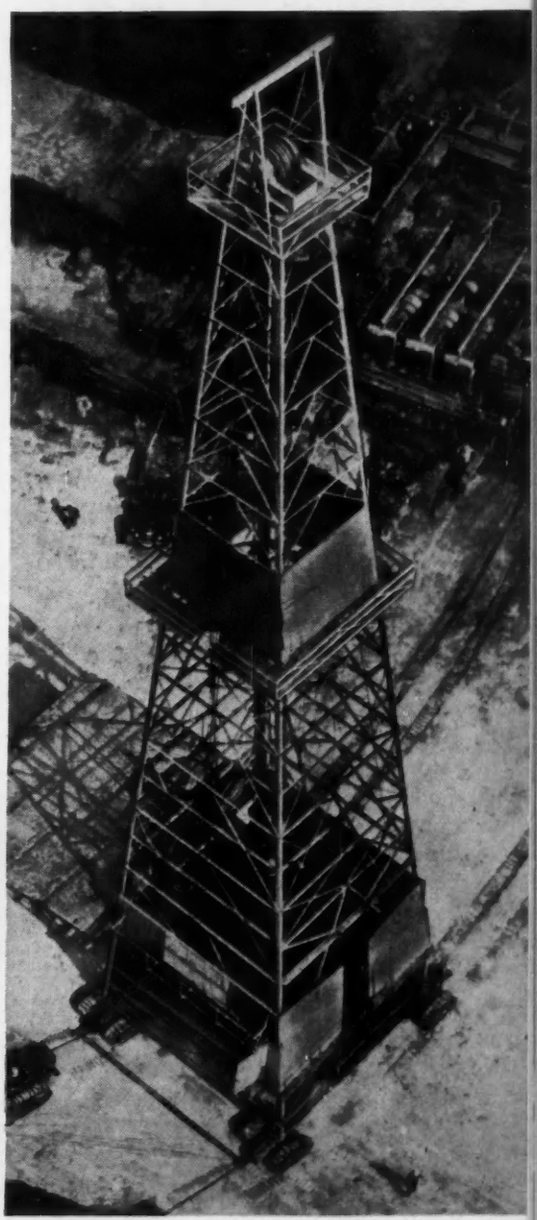

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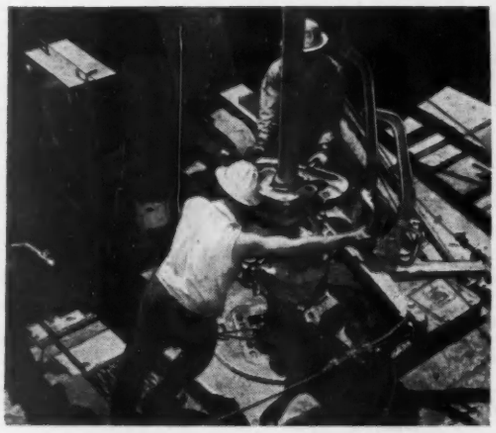

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may not be faulted. The crude is 45-gravity with low viscosity.

Well Md 2 was drilled to basement, topped at 12,625 feet. The pay sand at Hassi-Messaoud was believed to be Cambro-Ordovician in age, instead of Triassic as previously thought.

By May, 1958, Md 7 was reported to have had shows of production, extending the field an additional five miles southward. Om 8 also was said to have extended the field five miles north of Om 1. If these wells are completed as expected, the field then would be about 20 miles in the north-south direction, and at least 12 miles from east to west (see WORLD OIL, page 233 April 1958, Two Sahara Areas Confirmed as Major Fields).

**Zarzaitine.** Compagnie de Recherches et d'Exploitation de Petrole au Sahara (CREPS) spudded Zarzaitine 101 on February 22, and completed it on May 18, 1957, for 1.3 MMcf of gas per day from the Visean and upper Devonian formations, with total depth at 4108 feet. Zarzaitine is about 35 miles north of Edjele, and near the Libyan border.

Little importance was attached to this discovery until the spring of 1958, when Zr 2, located south of the new gas deposit, found 164 feet of oil-saturated lower Devonian sand from 4,360 to 4,524 feet and was completed flowing 3,200 barrels per day of 43-gravity oil. As of mid-1958, two Carboniferous gas zones, one Ordovician gas pay, and the lower Devoian oil zone had been proven at Zarzaitine.

CREPS continued to develop Edjele field, where 10 wells were completed in 1957, with three more being drilled at year's end. Six wells were completed at Tiguentourine, with two others being drilled as of December 31.

In May, 1958, reports from Paris told of two more CREPS discoveries, one a gas well at El Adeb Larache 1, south of Tiguentourine, and the other an oil strike at Oued Oubarakat.

CREPS' exploration efforts on its western permits near In Salah continued to find gas. Meredoua 101 was completed in April, 1957, at a total depth of 4,655 feet for a gas well in the Ordovician. Bahar el Hammar 301 was completed in October for gas from the same formation, with total depth at 5,180 feet.

**Gas discovery.** A major gas field located about 130 miles due south of Algiers at Hassi R'Mel was believed to have been proven by the end of 1957. The discovery well, SN REPAL Hr 1, on the Berriane permit was spudded in September, 1956, and completed early in 1957 for a high pressure wet gas well in Triassic sandstone.

Hr 2, eight miles southwest of the discovery, was completed later in 1957. The discovery well, located on a relection seismic prospect, found 154 feet of net gas-bearing sandstone and produced initially at a rate of 18 MMcf daily with 4,400 psi formation pressure. The gas oil ratio was 20,000 cubic feet per barrel of liquids. The reserve was estimated at 100 billion cubic feet of gas and 150 million barrels of condensates.

Compagnie des Petroles d'Algerie (CPA) continued exploration in the Fort Miribel-Fort MacMahon area north of In Salah, competing nine tests totaling 57,924 feet of hole during 1957. Two tests were being drilled at the close of the year, but operations were becoming increasingly difficult because of civil unrest which caused some shutdowns in December.

CPA completed three wells with good gas flows last year. Tineldjame 1, on the Tademait permit, was drilled to 6,242 feet. A zone at 4,921 feet tested 4,238 Mcf daily, and a second test at 5,085 feet indicated a flow of 12,713 Mcf per day. Kreschba 1, on the same permit 50 miles to the northwest, was drilled to 6,289 feet. A zone tested 6,357 Mcf daily. Bou Hadid 2, located on the In Belbel permit 31 miles northeast of Adrar, was drilled to 3,159 feet and tested 1,059 Mcf daily.

Compagnie d'Exploration Petroliere (CEP) conducted exploration on permits southwest of CPA's areas and west of CREPS' western permits.

According to the American Association of Petroleum Geologists *Bulletin*, a total of 281 party months of surveys was conducted in 1957 in Algeria, including 161.5 party months of seismograph work, 44.4 months of gravitimeter, 42 months of surface geology, 20 months of structure drill, and 13.2 crew months of aerial magnetometer surveys. CEP, CREPS and SN REPAL, in that order, conducted the greatest number of party months.

**Concessions.** Early in 1958, seven groups received new exploration permits in the central Sahara, centered in the Hassi-Messaoud-Ouargla area. Included are the first U. S. interests to enter exploration in Algeria.

A group, composed 45 percent by Sinclair Petroleum Company, subsidiary of Sinclair Oil Corporation, and Newmont Mining Corporation, and 55 percent owned by Societe Francaise de Recherches et d'Exploitation de Petrole (SAFREP), Lazard Freres et Cie. and 1'Omnium de Valeurs Agricoles Industrielles et Minieres, received 1,931 square miles in five tracts. Africa-Cities Service Company (49 percent) and its French partners, Societe de Prospection et Exploitations Petrolieres en Alsace (PREPA) and Franco-Africaine de Recherches Petrolieres (FRANCAREP) received 2,470 square miles in three tracts. Phillips Petroleum Company has a 25 percent interest in 1,275 square miles in two tracts. Compagnie des Petroles France-Afrique (COPEFA) is the operator, with Omnium de Recherches et Exploitations Petrolieres (OMNIREX) being the other partner.

CPA received 1,050 square miles in two tracts. CREPS received one tract of 1,050 square miles. Petroles de Valence, half owned by French interests and half owned by The British Petroleum Company interests, received a 1,775 square mile block. SNPA received 3,000 square miles in three tracts. Thus even more vigorous exploration can be expected than has occurred heretofore in the Sahara.

In May, 1958, CFP (A) received exclusive exploitation rights on tracts in Hassi-Messaoud and Hassi R'Mel fields, and SN REPAL received a similar permit on a portion of Hassi Messaoud.

**Pipe lines.** A 112-mile, 6-inch pipe line to carry crude from Hassi Messaoud field to the railhead at Touggourt was completed at the end of 1957.

A number of pipe line proposals have been suggested to get Sahara oil and gas to markets. It will be necessary to find an outlet for crude being found at Edjele, Tiguentourine and Zarzaitine. An all-Algerian line, Edjele-Hassi-Messaoud-Bone has been proposed; another from Edjele to Gafsa, passing through Tunisia; and still another from Edjele to Zoarra, through Libya. The latter one, if built, might take on crude found by Esso Standard (Libya) Inc, in the Fezzan.

ACKNOWLEDGMENT

The source of much of the information in this article is Le Journal des Carburants.

# Egypt . . . Crude production increases to 45,140 barrels daily as Belayim field almost triples its output

EGYPT MADE rapid strides toward self-sufficiency in petroleum production during 1957 and 1958, despite being hampered by the effects of the Suez crisis during the early months of last year.

Production from Belayim field, proved as a major reserve during the past three years, almost tripled during 1957 as compared with the previous year. Operated by the Cooperative Society for Petroleum, Belayim field produced at an average rate of 12,666 barrels daily last year, accounting for 28 percent of Egyptian production during 1957. With domestic demand running at about 85,000 barrels per day, it was clear that Egypt was closing the gap between production and consumption, Though refining facilities were not yet equal to the task of providing all needed specialty products, Egypt was in a position to export crude oil to Italy during the first half of 1958.

Ras Gharib field, located on the west side of the Gulf of Suez, led other Egyptian oil fields with a 1957 production figure of 7,856,000 barrels, or 21,523 barrels daily, representing a 9.3 percent increase over 1956. Ras Gharib, along with Hurghada and Gemsa fields, lie on leases owned by Anglo-Egyptian Oilfields, a member of the Royal Dutch Shell group. Since considerable British capital is involved in the Shell companies, Anglo-Egyptian's properties were "sequestrated" by the Egyptian government as a basis for reparations claims against Britain pursuant to the attack on Suez late in 1956.

As 1958 wore on, it was hoped that this controversy would be settled following an agreement between the Egyptian government and the Universal Suez Canal Company. The agreement, intended to compensate the Canal Company for the Egyptian government's seizure of the canal in 1956, was to be presented for approval to the stockholders in July, 1958. If approved, it was hoped that the "sequestration" of Anglo-Egyptian properties might be resolved also.

In the meantime, the Egyptian government continued to operate Ras Gharib, Hurghada, and Gemsa fields, and to operate, jointly with Mobil Oil

See Insert Map

Egypt, Inc, Sudr, Asl, and Ras Matarma fields. Anglo-Egyptian operated the last three fields prior to the Suez crisis.

**Government department.** Early in 1957, a new department under the Ministry of Industry was formed by the Egyptian government, part of a program of increasing government participation in the oil industry, to supervise oil exploration in areas where licenses are held by the government. On Feb. 9, 1957, International Egyptian Oil Company reached an agreement with the government and ceded its rights and obligations in Egypt to Eastern Petroleum Company of Egypt.

Eastern Oil Company continued to develop a lucrative trend along the western shore of the Sinai peninsula. As of April, 1958, 23 wells were producing oil at about 24,000 barrels daily at Belayim, with three rigs in operation. At Feiran field 10 miles to the north, two wells were producing a total of 400 barrels daily. A wildcat was being drilled at Sidri, 10 miles north of Feiran.

An important discovery was made by Eastern Petroleum Company at Abu Rudeis, about 18 miles north of Feiran. Abu Rudeis 2 was completed in July, 1957, for 1,000 barrels of 23-gravity oil per day on quarter-inch choke from lower Miocene between 8,592 and 8,936 feet. Confirmation test was completed at Rudeis 3, about 3,000 feet south of Rudeis 1, for 4,400 barrels daily from the same pay zone. In April, 1958, these two wells were producing about 5,000 barrels daily, with one rig drilling in the field.

The outlook was for stepped-up drilling in the Gulf of Suez area, including offshore drilling.

General Petroleum Company, the government exploration firm set up under the Ministry of Industry, began wildcatting in early 1958. At Ras Bakr, on the west side of the Suez Gulf, oil was reported discovered at about 4,250 feet.

**Western desert.** Sahara Petroleum Company, a subsidiary of Continental Oil Company, continued wildcatting in the vast western desert area, though with discouraging results. Sahara is the operator for The Ohio Oil Company. Cities Service and Richfield Oil Corporation as well as Continental.

Betty 1, in the center of the Qattara Depression, was spudded Sept. 15, 1956, and abandoned on June 19, 1957, at 14,643 feet. Bahariya Oasis 1, located in the extreme south about 140 miles southwest of Cairo, was spudded July 7, 1957, and abandoned a month later at 6,042 feet. Ghazalat 1, spudded Sept. 19, 1957 in Qattara 35 miles northwest of the Betty well, was abandoned on Jan. 3, 1958, at 10,082 feet. Fughur 1, located near the Libyan border about 75 miles inland from the coast, was drilling ahead early in 1958.

**Crude Oil Production in Egypt in 1957***

| Name of Field | Name of Company | Production in 1957 (Barrels) | 1957 Production (Barrels Per Day) | 1956 Production (Barrels Per Day) | Percent Change, 1957 from 1956 (Daily Rate) | Total Wells Drilled as of End of 1957 |
|---|---|---|---|---|---|---|
| Ras Gharib | Anglo-Egyptian Oilfields, Ltd.** | 7,856,000 | 21,523 | 19,698 | + 9.3 | 169 |
| Hurghada | Anglo-Egyptian Oilfields, Ltd.** | 211,000 | 578 | 711 | —18.7 | 139 |
| Gemsa | Anglo-Egyptian Oilfields, Ltd.** | 13,000 | 36 | 5 | +620 | 125 |
| Belayim | Cooperative Society for Petroleum | 4,623,180 | 12,666 | 4,913 | +157.8 | 27 |
| Abu Rudeis | Cooperative Society for Petroleum | 417,814 | 1,145 | ..... | ..... | 2 |
| Feiran | Cooperative Society for Petroleum | 131,224 | 360 | 579 | — 37.8 | 5 |
| Sudr | Anglo-Egyptian Oilfields, Ltd. and Mobil Oil Egypt Inc.** | 2,034,432 | 5,574 | 4,942 | + 12.8 | 33 |
| Asl | Anglo-Egyptian Oilfields, Ltd. and Mobil Oil Egypt Inc.** | 1,088,946 | 2,983 | 2,686 | + 11.1 | 29 |
| Ras Matarma | Anglo-Egyptian Oilfields, Ltd. and Mobil Oil Egypt Inc.** | 100,444 | 274 | 307 | — 10.7 | 6 |
| | Totals | 16,476,040 | 45,140 | 33,263 | + 35.7 | 535 |

* Some of these figures reprinted from the **Bulletin**, American Association of Petroleum Geologists.
** Anglo-Egyptian Oilfields' properties were "sequestrated" and run by the Egyptian government during 1957.

# Morocco . . .

## Field depletion cuts output

VIGOROUS EXPLORATORY and development drilling was continued in French Morocco by Societe Cherifienne des Petroles in Rharb Basin near Petitjean, along a trend of complexly-faulted sediments lying to the southwest. Most of the new wells were completed in Jurassic horizons, either Domerian or Dogger. Twenty completions were reported, including nine oil wells. A gas discovery was also reported. Despite the strong drilling effort, heavy depletion of the oil fields again failed to be offset by new wells completed in 1957.

Three wells were completed in Bled Khatara field, including one oil producer, one dry hole, and an injection well. Total depths varied from 5,102 to 5,413 feet. Five wells were completed in the Bou Draa field, including four oil wells and one dry hole, with total depths varying from 2,680 to 3,022 feet. A new oil field was found in the Dogger in a fault block at Djebel Haricha, about four miles northeast of Petitjean, and eight wells, including four producers were completed there in 1957, with two wells being drilled at the end of the year.

In southwest Morocco, 30 miles east of Mogador, the Kechoula well (KE 1) was reported drilling at the end of 1957, having found a number of gas horizons in the Jurassic, including one condensate zone. In other exploratory drilling, three tests drilled near Port Lyautey west of the main productive region to total depths varying between 5,167 and 6,167 feet, were dry holes. Four wells were drilling at the end of the year. In 1958, drilling at Haricha and Kechoula was to be stressed.

The old protectorate of Spanish Morocco has been incorporated into the Moroccan empire, and Moroccan laws now apply to "Morocco (North Zone)." The Spanish firm Adaro continued to conduct surface geological exploration on several structures in this area, including two diapirs located southeast of Larache.

**Production and Drilling in Morocco in 1957***

| Name of Company | Crude Oil Production in 1957, in Barrels | 1957-Crude Production, in Barrels Daily | 1956 Crued Production, in Barrels Daily | Percent Change in 1957 | Number of Wells Completed in 1957 | | | | Footage Drilled in 1957 | Footage Drilled in 1956 | Percent Change in 1957 | Number Wells Drilling, 12-31-57 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Oil | Gas | Dry | Total | | | | |
| Societe Cherifienne des Petroles..... | 565,638 | 1,550 | 1,967 | —21.2 | 9 | 0 | 11† | 20† | 97,082 | 113,384 | —15.8 | 4 |

* Adapted for **Le Journal des Carburants.**
† Includes well KH R 31, completed at Bled Khatara as an injection well for pressure maintenance.

# Tunisia . . . SEREPT carries its wildcatting program into 1958; Conorada gets concession

SOCIETE DE RECHERCHES et d'Exploitation des Petroles en Tunisie (SEREPT) was the only firm to operate actively in Tunisia during 1957. Small production from Cape Bon gas field was boosted to 582,510 cubic feet daily during the year, but the small attendant natural gasoline production of previous years was not reported. Drilling footage was increased slightly to 36,110 feet last year.

SEREPT received four exploration concessions in Tunisia last year, totaling 5,697 square miles, bringing the total of such grants made since 1954 to 22,524 square miles. Five areas were dropped, all lying north of Gabes, concentrated west and southwest of Cape Bon. All drilling activities were concentrated south of Gabes. Two new permits were applied for in the Sahara along the Algerian border in the extreme southwest.

SEREPT complete five full-hole tests during 1957, and two more were drilling at the year's end. At Djebel Tebaga, well TB 1, spudded in 1955, was abandoned at 13,204 feet in upper Paleozoics in January, 1957. At Kirchaou, well KR 1, spudded in March, 1956, reached a total depth of 9,806 feet in Ordovician quartzite in May, 1957. At Bordj-le-Boeuf, Well SN 1 was drilling at 10,674 feet in Ordovician quartzite on December 31. At Bir Soltane, a test was finished in December at 9,237 feet in upper Permian beds. Two other shallower tests were abandoned last year. In addition, a small rig drilled two stratigraphic holes to depths of 1,909 and 1,437 feet, respectively.

Two seimic crews worked during the year, emphasizing reconnaissance work in the Djeffara permit. SEREPT carried its wildcatting program into 1958, with one light, one stratigraphic, and two heavy rigs working.

On April 26, 1958, a new 10,979-square-mile concession was granted officially to Conorada Petroleum Corporation in western Tunisia.

# Other Africa . . . Accelerated exploration activities lead to significant oil discoveries

INCREASED EXPLORATORY drilling programs throughout other African countries were reported for 1957 and the first half of 1958. Major developments during the past year included a discovery of oil in Libya, initial production in French Equatorial Africa and Nigeria, and an increase in Angola's crude output. Details follow:

### Libya

EXPLORATION IN Libya was getting into high gear in 1957 and 1958, with a number of companies completing reconnaissance exploration and reaching the drilling stage. Esso Standard (Libya) Inc. found oil at a remote location, Atshan 2, in the Fezzan, at the end of December.

Drilled down-structure to test a Devonian sandstone that showed wet gas in Atshan 1 (a dry hole abandoned on December 5), Atshan 2 tested 500 barrels of 44.5-gravity oil from 2,100-2,136 feet in Devonian sand. Atshan 3, however, was a dry hole, and the size of the field remained a question as of midyear 1958.

In July, 1958, Oasis Oil Company, subsidiary of The Ohio Oil Company, found oil at Bahi 1, located in eastern Tripolitania 93 miles southeast of the town of Sirte and 65 miles inland

from the Gulf of Sirte. Top of pay was reported at 5,806 feet. A 2½-hour drillstem test of the interval 5,822-5,854 feet was said to have recovered 75 barrels of 30-gravity oil. The age of the pay was Cretaceous or older. There was some question whether the well would continue to flow.

Oasis originally had planned to drill the Bahi well to 15,000 feet or basement. Developments would be watched closely on this discovery, especially since it is located near the Mediterranean coast and more readily accessible to potential markets than Esso's disovery. Recent disruptive events in Iraq have further enhanced the importance of potential crude oil sources in Libya.

**Prospects.** The outlook for exploration was bright, despite the short period since 1955 when enabling legislation was enacted in Libya to allow firms to acquire concessions and commence the oil search.

With the exception of three wells drilled by Libyan-American Oil Company near Bengasi in Zone 2, all wells drilled so far in Libya have had oil and/or gas shows. One shallow hole not drilled for oil blew out when a shallow gas sand was tapped. The oil industry was already the biggest industry in Libya, even before oil was found.

**Concessions.** The 1955 Petroleum Law remains unchanged, though the Petroleum Commission has worked out specific time deadlines for the commencement of drilling by some concessionaires in order to hasten the exploratory pace. Three concessions were granted in 1957 to Gulf Oil Corporation, including large tracts in Zone 1, Zone 3, and two in Zone 4 (Fezzan). Gulf was scheduled to spud its first well, at Geramna 1 in Fezzan in midyear 1958.

Pan American Petroleum Corporation also received two new concession blocks during the year, in Fezzan. American Overseas Petroleum Ltd., operator for Texaco Overseas Petroleum Company and California Asiatic Oil Company, was expected to start work on a new 15,615-square-mile concession in Fezzan early in 1958. The new block was granted late in 1957, adding to previous grants to Caltex group companies in Zones 1 and 2. In addition, D'Arcy Exploration Company (Africa) Ltd. was granted 7,000 square miles in concessions in Zone 1, and 29,096 square miles in Zone 4 on July 14, 1957.

As of early 1958, a total of 361,502 square miles was under concession in Libya, representing more than half of the national area of about 675,675 square miles.

At the end of 1957, there were 67 concessions in effect in Libya, three others were awaiting approval and five applications were pending.

**Exploration programs.** By the end of 1957, there were 43 geological parties, 24 gravimetric and/or magnetic crews, and 16 seismic teams working in Libya. Aerial photographic and geologic surveys, topographic studies and mine clearance programs also were conducted. Much of the coastal area was covered by a marine seismic survey last year. The number of party months of exploratory work in 1957 were as follows: geological, 281; gravimetric and magnetic, 237; seismograph, 107. In 1958, the following party-months totals were projected: geological, 193; gravimetric-magnetic, 194; and seismic, 198.

## Senegal

INTEREST CONTINUED in the oil possibilities of Atlantic Coastal regions in Senegal, as well as Gambia and Portuguese Guinea to the south. Societe Africaine des Petroles (SAP), a French government company, holds 4,145 square miles in its Dakar permit which dates to 1955. It includes a roughly triangular coastal area bounded on the north by 15° 50′ North latitude, on the west by Dakar, and on the south by 14° North latitude.

SAP completed six wells on this permit in 1957, representing about 33,000 feet of hole. One other test, Cap Vert 1 near Dakar, was being drilled below 10,950 feet at the end of the year. A previous test, N'Diass 1, located 22 miles east of Dakar, was drilled to a total depth of 13,158 feet in lower Cretaceous beds and abandoned on May 22, 1957.

Societe des Petroles du Senegal (SPS), a company jointly owned by French government and The British Petroleum Company interests, had selected a site for a deep test in the Casamance area of South Senegal, located 150 miles south of Dakar, by the end of 1957. By Feb. 20, 1958, a rig rated to 12,000 feet had arrived

**Drilling in Libya in 1956, 1957, and early 1958**

| NAME OF COMPANY | Concession | Zone | Name of Well | Date Well Spudded | Results, Total Depth, and Formation | Date Completed | Depth At End of Year | Remarks |
|---|---|---|---|---|---|---|---|---|
| Libyan-American Oil Company.... | 18 | 2 | Gerdes el Abid 1 | 4-30-56 | Dry—9,372 ft. in Lower Cretaceous | 1-25-57 | 9,372 feet | ..... |
| Libyan-American Oil Company.... | 18 | 2 | Maraua 1 | 2- -57 | Dry—2,212 ft. in Lower Cretaceous | 5-28-57 | ..... | ..... |
| Libyan-American Oil Company.... | 18 | 2 | Maraua 1a | 6- 3-57 | Dry—8,652 ft. in Lower Cretaceous | 10-24-57 | ..... | ..... |
| Libyan-American Oil Company.... | 18 | 2 | Farzugha 1 | 11- 9-57 | Dry—12,000 ft. in Upper Jurassic | 2- 9-58 | 7,790 feet | ..... |
| Esso Standard (Libya) Inc..... | 1 | 4 | Haghe 1 | 6-28-57 | Dry—3,491. Basement found at 3,385 feet. | 9- 1-57 | ..... | Oil shows above 1,100 Feet. |
| Esso Standard (Libya) Inc..... | 1 | 4 | Atshan 1 | 9-22-57 | Dry—4,137 feet | 12- 5-57 | ..... | Wet gas show at 2,000 feet in Devonian sand |
| Esso Standard (Libya) Inc..... | 1 | 4 | Atshan 2 | 12-12-57 | Oil discovery TD 2,960 feet. 500 bbls. daily, 44.5 gravity, 2,100-36 Devonian sand. | 1-20-58 | 2,581 feet | First oil discovery in Libya. |
| Esso Standard (Linya) Inc..... | 6 | 2 | El Jahama 1 | 1- 1-58 | Drilling at 9,824 ft. on 4-14-58. | ..... | ..... | ..... |
| Esso Standard (Libya) Inc..... | 1 | 4 | Atshan 3 | 1-26-58 | Dry—2,430 | 2-14-58 | ..... | ..... |
| Esso Standard (Libya) Inc..... | 1 | 4 | Tasonee 1 | 2-26-58 | Drilling at 4,156 feet on 4-14-58 | ..... | ..... | ..... |
| Mobil Oil of Canada Ltd..... | 57 | 1 | El Gattar 1 | 11- 3-57 | Dry—6,280 ft. Basement at 6,170 ft. | 2-18-58 | 4,253 feet | ..... |
| Mobil Oil of Candda Ltd..... | 11 | 1 | Hofra 1 | 3- 9-58 | Dry—4,374 ft. | 3- 9-58 | ..... | ..... |
| D'Arcy Exploration Company (Africa) Ltd. | 34 | 1 | Castel Benito (Tarhuna) 1 | 12-22-57 | Drilling at 1,700 ft. on 4-14-58. | ..... | 261 feet | ..... |
| Compagnie des Petroles de Libye.. | 49 | 4 | Hasi Infertas 1 | 3-17-58 | Drilling at 777 ft. on 4-14-58 | ..... | ..... | ..... |
| Oasis Oil Company..... | 32 | 1 | Bahi 1 | 3-28-58 | Drilling at 2,400 ft. on 4-14-58 | ..... | ..... | Later reported as an oil discovery at 5,800 feet. |
| Gulf Oil Corporation..... | 67 | 4 | Geramna 1 | ..... | Rigging up on 4-14-58 | ..... | ..... | ..... |
| Anglo-Saxon Petroleum Company.. | 52 | 4 | Al-52 | ..... | Rigging up on 4-14-58. | ..... | ..... | ..... |

Footages drilled: in 1956—9,372 feet, in 1957—33,377 feet. Eight wells completed.
Identifications of Zones in Libya: 1—Tripolitania; 2—Cyrenaica north of 28th parallel; 3—the rest of Cyrenaica; 4—Fezzan.

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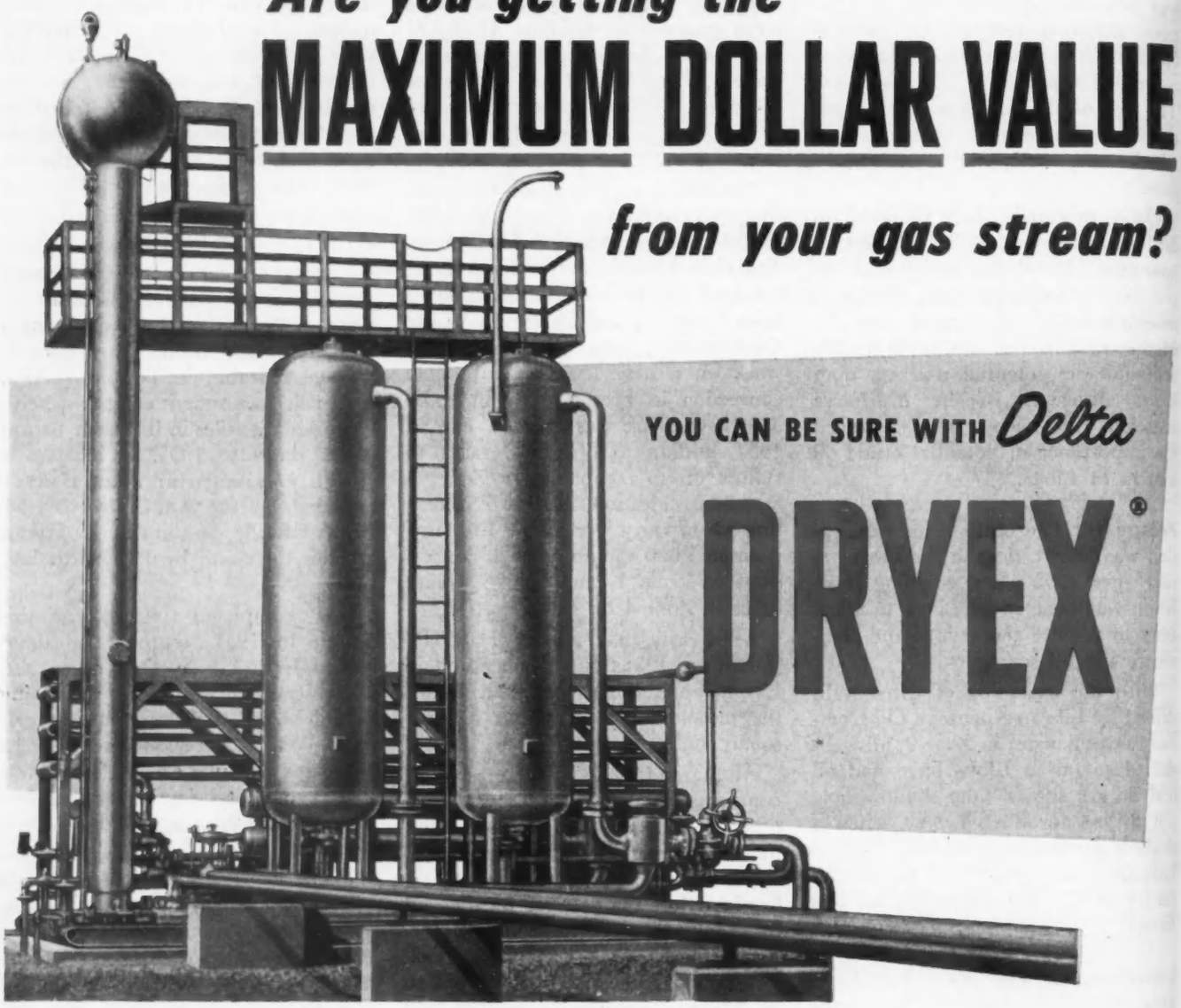


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at Dakar, having been shipped from Iraq. The well, known as Balandine 1, had been spudded by April 1.

## Gambia

IN GAMBIA, a gravity survey begun by The British Petroleum Company Ltd. in 1956 was continued through the first five months of 1957. The French organization, Bureau de Recherches de Petrole (BRP), has a 50 percent interest in the Gambia license, with BP working as operator.

Gravity, geological and seismograph work were being coordinated, including data from a previous waterborne seismic survey conducted in 1955 along the Gambia River, and data from adjoining areas. The exploration license was renewed for one year from Dec. 1, 1957.

## Portuguese Guinea

SOUTH OF SPS' Balandine 1 location in Gambia, a new 11-million acre concession was granted early in 1958 in Portuguese Guinea to Standard Oil Company (New Jersey). A new Jersey affiliate, Esso Exploration Guinea, Inc., will work the region, including offshore waters as well as mainland areas.

The company must spend at least $7 million exploration over a five-year period. If commercial production is found, any profits will be split with the government on a 50-50 basis.

## Ivory Coast

SOCIETE AFRICAINE des Petroles (SAP) conducted exploration on its 3,722-square-mile Ivory Coast permit, awarded in July 1957. Three straitigraphic tests were being drilled late last year, following some reconnaissance seismic work done last summer in the coastal area.

A total of 5,655 feet of hole was reported in the three wells drilled last year, one of which was still drilling at the end of December. Marine seismic work and stratigraphic drilling were to be continued by SAP throughout 1958, and a heavy rig may be brought in late this year. Photogeological work also was being done in 1958.

By April, 1958, tentative approval had been received from the French government for minority U.S. interests to join the oil search on the Ivory Coast. Pursuant to recent negotiations, Plymouth Oil Company, Benedum-Trees Oil Company, and M. L. Benedum were to have interests of 39, 5, and 5 percent respectively, in the venture, with SAP maintaining 51 percent interest.

## Ghana

GULF OIL COMPANY of Ghana, affiliate of Gulf Oil Corporation, continued exploration in the Gold Coast in 1957. Three wildcat tests were drilled and abandoned, totaling 19,494 feet of hole.

Epunsa 1, spudded late in 1956 along the coast seven miles west of Half Assini, was drilled to a total depth of 6,791 feet. Bonyeri 1, located just west of a coastal town of the same name, was drilled to 8,190 feet and abandoned. Kobnaswaso 2, located three miles west of Bonyeri 1 and close to a previous dry hole, was abandoned at 4,513 feet. Drilling was suspended at the end of 1957.

Gulf still holds the concession, but was evaluating subsurface data before starting a new drilling program. A seismic crew was moving in during May, 1958. In the meantime, the rig had been moved to Cabinda.


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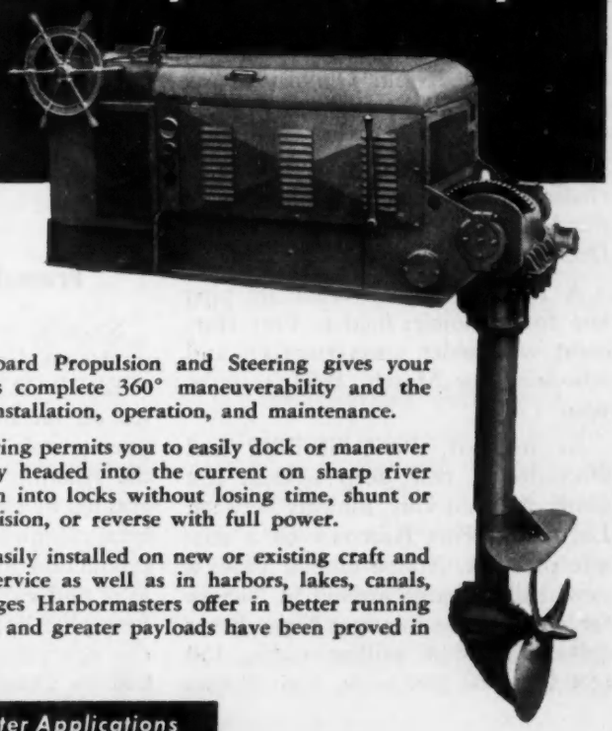

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## Nigeria

NIGERIA JOINED the oil-producer nations during 1957, as Shell-BP Development Company of Nigeria Ltd. allowed four wells in Oloibiri field in the Niger River delta to start flowing late last year. Crude production amounted to 8,960 barrels, with oil flowing at the rate of 880 barrels daily during December, 1957.

The first cargo of 65,000 barrels of Nigerian crude arrived at Rotterdam in The Netherlands early in March, 1958, after being exported from Port Harcourt on February 17. In March, the second consignment, 105,000 barrels, was exported to Great Britain. Afam oil field was found late in 1956, but Afam 2, drilled in 1957, was a dry hole. Development continued, and by the end of 1957, a total of five wells had been drilled, including three flowing wells and two dry holes. At Oloibiri, Well 3 was completed as 1956 ended, and Oloibiri 4 was being drilled at the beginning of the year. By the end of 1957, seven wells had been completed at Oloibiri, including four producers. Another well was being drilled there at the end of December.

A 10-inch, 65-mile crude oil pipe line from Oloibiri field to Port Harcourt was under construction and scheduled for March, 1958, completion.

By midyear, 1957, Shell-BP had scheduled a new deep wildcat test south of Benin City, midway between Lagos and Port Harcourt on a seismic prospect. At the end of 1957, a new drilling barge arrived in Nigeria for work in the swampy Niger River delta. This $3.6 million outfit, 158 feet long, 80 feet wide, and 10 feet deep, mounts a rig rated to 12,000 feet.

Early in 1958, Shell-BP announced discovery of a third oil field, in the Niger delta at Soku, Rivers Province, 30 miles west of Port Harcourt. The discovery well was drilled to 10,000 feet. It was the sixteenth wildcat to be drilled in Nigeria. Shell-BP had spent more than $75 million in the country in the oil search by the end of 1957, including $48 million since the start of 1953. The company drilled more than 100,000 feet of hole in Nigeria in 1957 and had five drilling rigs operating by early 1958. By the end of this year, at least eight rigs were scheduled to be drilling.

**Socony operations.** Mobil Exploration Nigeria Ltd. has a 12,700-square-mile oil exploration license in northwestern Nigeria. The Socony Mobil affiliate was granted a two-year license in 1955 on 281,000 square miles, but requested and received renewal on only 12,700 square miles in November, 1957, located in Sokoto province and being the northwest part of the original license.

## French Cameroons

SOCIETE DE RECHERCHES et e'Exploitation des Petroles du Cameroun (SEREP-CA) continued the search for oil on its 3,475-square-mile, 10-year permit centered at Douala on the Atlantic Coast. The permit was granted in 1952. Several gas wells had been completed prior to 1957, but oil production had yet to be established as of midyear 1958. Activity was down somewhat last year, as one of the two rigs operating there was sent to Gabon on October 1.

### Nigeria's Oil Fields as of the End of 1957

1. **Country: Nigeria.**
2. **Name of Company: Shell-BP Development Company of Nigeria, Limited.**

| 3. Name of Field (or Producing Area) | Akata | Oloibiri | Afam |
|---|---|---|---|
| 4. Year of discovery | 1953 | 1956 | 1957 |
| 5. Footage drilled during 1957 | 0 | 47,158 | 45,754 |
| 6. Number of wells completed during 1957—a Oil wells | 0 | 2 | 2 |
| b Gas wells | 0 | 0 | 1 |
| c Dry holes | 0 | 3 | 1 |
| d Suspended | 0 | 0 | 0 |
| 7. Number of wells actually drilling at end of 1957 | 0 | 1 | 0 |
| 8. Number of drilling wells suspended at end of 1957 | 0 | 0 | 0 |
| 9. Number of flowing wells at end of 1957 | 0 | 4 | 3 |
| 10. Number of pumping wells at end of 1957 | 0 | 0 | 0 |
| 11. Number of other artificial lift wells at end of 1957 | 0 | 0 | 0 |
| 12. Total number of wells drilled to end of 1957 | 8 | 7 | 5 |
| 13. Producing depths at end of 1957, in feet | 5,500′-7,000′ | 8,000′-9,500′ | 9,000′-9,500′ |
| 14. Gross clean crude production during 1957, in barrels | 0 | 8,960 | 0 |
| 15. Average production during last month of 1957, in b/d | 0 | 880 | 0 |
| 16. Cumulative production up to end of 1957 in barrels | 0 | 8,960 | 0 |
| 17. Base of crude | Paraffin | Paraffin | Paraffin |
| 18. A.P.I. gravity of crude | 48° | 20°—26° | 36.5°—44.5° |
| 19. Age and type of producing formation | Miocene | Miocene | Miocene |

## French Equatorial Africa

THE DRILLING boom neared a climax in French Equatorial Africa and Moyen Congo in 1957 and 1958. Production began for the first time, during March, 1957. Average crude oil production last year was 3,511 barrels per day. Production in 1958 was expected to average more than 8,000 barrels per day, and to exceed 12,000 barrels daily in 1959.

In 1957, two new oil fields and a gas field were found. Several more new discoveries were reported in 1958. Last year 56 wells were completed, with 12 more drilling at the end of December. At least a dozen rigs were working in Gabon during 1958. Societe des Petroles de L'Afrique Equatoriale Francaise (SPAEF) appeared determined to test all the 100-odd salt domes said to have been located in Gabon. Fifteen new structures were to be tested in 1958.

At Point Clairette field, 22 wells were completed during 1957, and two more were being drilled at the end of December. Of these, 18 were oil wells, three were dry holes, and another blew out and was junked. At Ozouri field, seven wells were completed, including six oil wells and one dry hole. A wildcat, Animba 1, located about six miles east of Ozouri field, was completed on April 2, 1957, as an oil discovery, with total depth at 3,091 feet in salt. Two producers and four dry holes were completed on this prospect last year.

M'Bega 2, located about eight miles northeast of Ozouri field was completed Aug. 15, 1957, as an oil discovery, with total depth at 3,427 feet in salt. Seven oil wells and one dry hole were completed on this prospect last year.

In Moyen Congo, SPAEF spudded Pointe Indienne 1 on Sept. 2, 1957, and completed it on November 1 at total depth of 4,617 feet in lower Cretaceous as an oil discovery. At Tchengue in Gabon, located on the Atlantic coast between Ozouri and Point Clairette, wells TC 2 and TC 3 were completed as gas wells in 1957.

The American Association of Petroleum Geologists *Bulletin* has published a thorough description of the new fields in Gabon, which is summarized on the following page.

**Ozouri field.** Discovered in 1956, Ozouri field now is fully developed. The structure is a shallow salt dome, with salt at 3,300 feet. Of 16 wells completed through December, 1957, 9 were oil producers. About 2,800 barrels daily of 21-gravity crude flows from an average thickness of 150 feet of fractured cherty Eocene shales at depths of 2,000 feet to 2,300 feet. Bottom-hole pressure is 882 psi at 2,000 feet, and gas-oil ratio is 100 cubic feet per barrel. Reserves, though difficult to estimate, are thought to be at least 7 million barrels. Water-flooding was planned during 1958.

**Pointe Clairette field.** This field also is a salt dome, with salt found at 6,700 feet. There are four pay zones, two in Eocene fractured chert from 2,600 feet to 3,200 feet, a small Paleocene dolomite pay, and the main pay in Cretaceous sandstones varying up to 70 feet thick. Total effective pay varies up to 132 feet. Maximum depth of pays found is 5,000 feet. Oil is 32-gravity mixed-base, with a paraffinic tendency. GOR is 300.

**Animba field.** This is a salt dome field, with salt found at 3,100 feet. The discovery well found 112 feet of fractured Eocene chert from 1,683 feet to 1,795 feet, and was completed for 120 barrels of 14-gravity crude on a ¾-inch choke. Bottom hole pressure is 715 psi. The pay zone is erratic but thickens southward to 187 feet. Development was to continue in 1958.

**M'Bega field.** This field is a piercement-type dome with salt at 3,400 feet. The discovery well, MB 2 on the west flank, found non-commercial oil from 1,950 feet to 2,013 feet in Miocene dolomites. Production of 38 barrels per hour of 27-gravity oil was indicated by a drillstem test of Eocene fractured chert from 2,589 feet to 2,640 feet through ⅜-inch choke, with bottom-hole pressure 1,250 psi. Between 3,402 and 3,415 feet, fractured dolomite cap rock tested 76 barrels of 34-gravity oil with GOR 310 and bottom-hole pressure 1,492 psi. Wells were being drilled on 2,000-foot spacing. Average net pay was about 50 feet. Production varies from 250 to 500 barrels daily on ¼-inch bean. Production had reached 1,400 barrels daily and was to be boosted upon completion of a pipe line scheduled for July 1958.

**Tchengue gas field.** This new field also is a piercement-type dome. The discovery well, TC 2, found two fractured Eocene chert zones. The first, 60 feet thick at 3,450 feet, yielded 8.8 Mmcf daily. The value of the field was unknown at the start of 1958.

In addition, some gas was found at Ambouroue, several miles northeast of M'Bega. Well AB 2 made the discovery.

Early in 1958, an oil discovery was made at Gongoue on the coast, 30 miles northeast of Port Gentil. A 20-foot thick sand section tested 100 barrels of 35-gravity oil per hour, and the well was being deepened.

In Moyen Congo 10 miles north of Pointe Noire, Pointe Indienne 1 found 90 feet of sandy limestone and coquina from 4,440 feet to 4,529 feet with good oil shows and porosity varying from 10 to 25 percent. Permeability averaged 100 millidarcys. The zone tested from 50 to 105 barrels per hour of 45-gravity crude on ¼ and ½-inch chokes. Subsequent wells indicate the pay may be of a lenticular nature. A second rig was to be moved from Gabon to Moyen Congo in April.

## Cabinda

GULF OIL CORPORATION carried on negotiations with the Portuguese government for several years prior to the close of 1957 for a concession covering the small west African colony of Cabinda, located south of the Moyen Congo sector of Gabon and north of the mouth of the Congo River. A decree was issued last year in Lisbon, Portugal, authorizing the Overseas Ministry to conclude a concession with Gulf. In December, the concession reportedly was formally granted, and Cabinda Gulf Oil Company was to commence exploration.

The oil discovery reported at Pointe Indienne by Societe des Petroles de l'Afrique Equatoriale Francaise (SPAEF) in Moyen Congo is only about 12 miles northwest of the Cabinda border.

## Angola

ORDERLY DEVELOPMENT of two oil fields and exploratory drilling on new structures in Angola continued during 1957 and 1958. Crude oil production increased to an average of 229 barrels daily in 1957, compared to 171 barrels per day in 1956. Nine oil wells had been completed in Benfica and Luanda oil fields by the end of December, of which three were flowing and six were shut in. Twelve development wells were completed last year, including six oil wells and six dry holes.

Six wildcats also were completed, including a flowing oil well at 5,000 feet at Luanda 2 in February, 1957, and five dry holes—the first deep tests at Morro Da Cruz, Uacongo, Zango, Cacuaco and Viana. Drilling footage amounted to 117,741 feet in 1957, as compared with 46,857 feet of hole in 1956 and 29,604 feet in 1955.

Work was accelerated in the two main areas of interest, the Cuanza Basin in the south and Congo Basin in the north, both along the Atlantic Coast.

Surface geology, seismograph, core drilling, and micropaleontological studies were all being employed in the search. By the end of February, 1958, producing wells at Benfica field were considered capable of yielding 1,260 barrels daily and those at Luanda were rated at about 950 barrels per day.

## Southwest Africa

CONSIDERABLE concessions activity occurred in coastal area of Southwest Africa in 1957, although no drilling was reported as of midyear 1958. Reportedly, German geologists have worked the Stampriet area since 1954 on behalf of K. F. Albrecht and Company, representing West German and Belgian interest. At least 8 million acres are involved in 18-month exclusive oil prospecting permits published in the Official Gazette of Southwest Africa on Sept. 3, 1957.

These permits involve lands along the Atlantic Coast from the Angola border on the north to 25 degrees of south latitude and the Gibeon vicinity to the south. Onshore permits were granted to R. le Riches, J. Le Grange, J. F. Haak, C. Von Roeder, K. F. Albrecht, and H. H. U. Orth. Offshore permits extending to 800 yards into the Atlantic Ocean were granted to F. Walters, Republic Oil Company and Orth.

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## South Africa

In the Union of South Africa, the American Association of Petroleum Geologists *Bulletin* reported that a drilling program was completed in the Dannhauser area of northern Natal after six wells had been drilled to basement. Three of these wells were reported completed in 1956. Some oil shows, none of them commercial, were reported.

Standard-Vacuum Refining Company of South Africa, Pty., Ltd. reported an average throughput of 21,232 barrels of crude at its Durban refinery in 1957. Crude-charging capacity was expected to be increased to 24,000 barrels daily by the end of 1958.

## Madagascar

Societe des Petroles de Madagascar continued its search for oil in 1957 at about the same pace as in recent previous years, without finding production. Four tests were completed during 1957 in the Morondava Basin of southwestern Madagascar.

AJ-1, located on the coast about 10 miles south of Morombe, was drilled below 13,000 feet and abandoned. Other tests were completed at Befandriana, Beravy and Tulear. SPM drilled 40,317 feet of hole last year, compared to 31,002 feet in 1956. Two rigs continued drilling.

The company holds 65,000 acres along the southwest coast from Cape Saint Andre on the north, to the south end of the island. SPM continued its magnetic, gravity and seismic work in the Morondava Basin last year, while the Bureau de Recherche de Petrole (BRP) conducted surface geology, gravity, reflection seismograph and electrical resistivity reconnaisance exploration in the Majunga area of the northwest coast.

## Zanzibar

In Zanzibar, BP-Shell Petroleum Development Company of Zanzibar Limited completed its No. 1 deep test early in 1957 at 14,281 feet as a dry hole. A total of 1,681 feet, being the bottom segment of this hole which was spudded in May, 1956, was drilled last year. Gravity surveys were completed on nearby Pemba Island, but no other activity was reported.

## Mozambique

TWO DRY WILDCATS were abanboned by Mozambique Gulf Oil Company last year. Temane 1, located near the mouth of the Sabi River was abandoned early in 1957 after being drilled to 11,500 feet in 1956. The rig was moved about 40 miles north to Mambone 1. This test was drilled to 11,848 feet and was abandoned in July, representing the total footage drilled in Mozambique in 1957. A few gas shows were recorded. No wells were drilling at the end of 1957.

Despite the negative drilling results, Gulf added some acreage in new concessions toward the north, while dropping some acreage in southwestern Mozambique. The company held about 36,000 square miles as of December, 1957.

## Tanganyika

BP-SHELL DEVELOPMENT Company of Tanganyika drilled 11 shallow geological information holes during 1957, centered mainly between Kilwa and Lindi near the southeast coast. Total drilling amounted to 16,692, with an average depth of 1,517 feet. BP-Shell worked a combination refraction-reflection seismograph crew in Tanganyika throughout 1957, and expected to maintain it throughout 1958.

In addition, a gravity party was operating during the first half of 1957. The original exploration license expired on Dec. 23, 1957, but it was renewed for two years.

## Kenya

BP-SHELL RETAINED a prospecting license in southern Kenya but reported no exploratory work in 1957. Frobisher, Ltd., a Canadian company, reportedly received a 5 million-acre exploration license in northeastern Kenya recently.

In July, 1958, negotiations were reported between the Kenya government and Royal Dutch Shell toward the establishment of a new refinery at Mombasa.

## Somalia

ACTIVITY QUICKENED in Somalia during 1957 and 1958 as earlier concessionaires reached the drilling stage of their exploration programs, and new firms entered the search for oil.

Sinclair Somal Corporation abandoned Gira 1, located 27 miles west of Obbia at 12,764 feet due to mechanical difficulties in February, 1957. No shows were reported. The rig was moved to Obbia 1, located 40 miles northeast of Gira 1 near the Indian Ocean shore. Obbia 1 was drilled to below 16,000 feet and was abandoned at the end of 1957. This test was one of the deepest wells drilled so far in the Eastern Hemisphere.

Early in 1958, the rig was being moved to Marai Ascia 1, another projected deep test located 130 miles southwest of Obbia 1. A favorable marine sedimentary section was reported in Obbia 1, as was the case in the Gira test.

Sinclair Somal is owned by Sinclair Oil Corporation and Conorada Petroleum Corporation on a 50-50 basis. In April, 1957, Sinclair Somal relinquished one-fourth of its original concessions area, and had 42 million acres (about 65,000 square miles) in Somalia at the end of the year. Somal conducted 24 party months of seismic surveys and 23 party months of surface geology last year.

Standard-Vacuum Oil Company received a 10,300-square-mile prospecting permit in Somalia late in 1957, and was preparing to begin exploration in 1958.

Farther north near the coast toward Cape Hafun, the Italian AGIP agency had completed Sagaleh 1, near Bender Beila, a dry hole drilled to 10,720 feet in 1956, and was drilling a second test at Catton 1, about 40 miles north of Sagaleh 1 and about 35 miles inland from the coast. AGIP had not found oil by midyear 1958 in Somalia, but was hopeful of drilling a 14,000-foot test.

## British Somaliland

CONORADA PETROLEUM CORPORATION kept a rig in constant exploratory drilling service during 1957, in addition to conducting 24 party months of surface geology and 12 crew months of seismic work. Las Anod 1 was spudded on May 9 and completed on July 19, 1957, as a dry hole. Total depth was 5,459 feet. This location was in southeastern British Somaliland, near its common border with Ethiopia and Somalia.

The rig then was moved about 90 miles north to Faro Hills 1. The test was spudded August 7 and completed November 7 at a total depth of 5,372 feet. The next location was Buran 1, located 125 miles northeast of Faro Hills in the northeast corner of Conorada's concession. This test was drilling at 357 feet at the end of December.

Thus, two wells were completed last year in British Somaliland, and 11,188 feet of hole was drilled. Buran 1 was later abandoned at 8,000 feet, and a fourth test was being drilled by Conorada as of midyear 1958. Conorada's concession covers about 36,000 square miles.

Standard-Vacuum Oil Company expected to spud its first wildcat in British Somaliland by the end of this year. Stanvac operated one geophysical crew there in 1957. The British Petroleum Company, Ltd., completed a geological survey and a gravity survey of its concession along the Gulf of Aden coast in Februray, 1957.

# Bahrain . . . Lone oil field ups production by 6.4 percent on 25th anniversary year

THE BAHRAIN Petroleum Company Ltd.'s production from the lone oil field on Bahrain Island was boosted by 6.4 percent over the 1956 rate last year to 11,691,462 barrels, or 32,031 barrels per day. A total of 143 oil wells were on production as of Dec. 31, 1957, up 13 from a year earlier. The sizable increase in 1957 occurred during the 25th anniversary year following Bapco's discovery of the Bahrain field at Jebel Dukhan 1, which came in on June 1, 1932.

No exploratory drilling was reported during 1957. A 12-month on-shore seismographic survey was completed last summer, and marine seismic surveys were carried out during the latter half of the year north of the mainland in the Fasht Jarim

vicinity and off the west coast of the island.

One well was being drilled at the end of last year.

Drilling rates were expected to decline further during 1958, with about 10 completions expected this year.

Four gas wells continued on production, with the gas being injected into oil pays for pressure maintenance purposes.

After the Anglo-French attack on Egypt in late 1956, King Saud banned shipments of Saudi Arabian oil to Britain and France, and shut down transmission of Saudi oil through submarine pipe lines to Bahrain until the ban was lifted early in 1957. Bapco's 203,700 barrel-a-day capacity Sitka refinery ran at reduced throughput until sufficient crude could be obtained from other Middle Eastern sources. Apparently, local production was increased during this period to make up part of the temporary deficit.

Foster Wheeler Corporation was expected to complete construction of an 11,000 barrel-per-day UOP platforming unit early in 1958 for Bapco at the Sitka refinery, the first such unit to be completed in the Middle East.

On March 1, 1958, announcement was made of an agreement between King Saud and the Sheikh of Bah-

See Insert Map

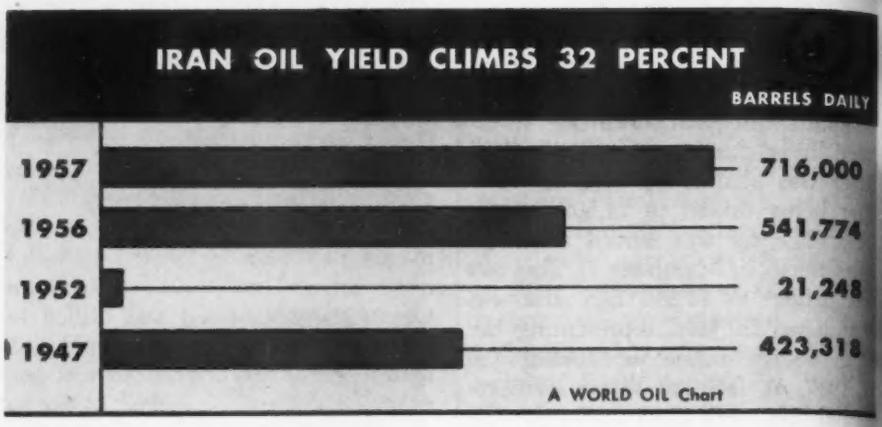
rain, settling an old dispute regarding oil rights in an underwater area between the coast of Saudi Arabia and Bahrain Island. The two chiefs of state agreed on a 50-50 split of any oil profits. Saudi Arabia was to arrange for development of the area. It was assumed that Arabian American Oil Company, owning the offshore concessions in the Persian Gulf in Saudi Arabian waters, with the exception of the Neutral Zone, would explore the Saudi Arabia-Bahrain underwater area.

**Production and Drilling in Bahrain in 1957 and 1956**

| | Production in Barrels | Daily Average in Barrels | WELLS COMPLETED | | | | |
|---|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total | Footage |
| 1957 | 11,691,462 | 32,031 | 17 | 0 | 0 | 17 | 36,914 |
| 1956 | 11,013,702 | 30,092 | 21 | 0 | 0 | 21 | 50,510 |

**Production Wells in Bahrain in 1957**

| OIL WELLS | | | | GAS WELLS | | | Total Producing Wells | Total Wells Shut In |
|---|---|---|---|---|---|---|---|---|
| Flowing | Pumping | Shut In | Total | Flowing | Shut In | Total | | |
| 143 | 0 | 8 | 151 | 4 | 0 | 4 | 147 | 8 |




# Iran . . . New expansion era indicated by law opening nation's prospective onshore and offshore areas

Progress of Iran's oil industry in 1957 and 1958 indicated a new era of expansion. Developments included:

- New legislation, opening tracts in Iran's highly prospective hinterlands and submerged Persian Gulf areas to foreign capital, became law in mid-1957.
- At about the same time, a partnership between National Iranian Oil Company and the Italian government firm Ente Nazionale Idrocarburi (ENI) was ratified, opening three areas outside the Consortium area of South Iran for exploration.
- On April 24, 1958, an agreement between NIOC and Pan American Petroleum Corporation, granting another important offshore concession in the Persian Gulf, was signed, and was ratified by the Iranian parliament by midyear.
- Iran solicited more bids under the new law and received an enthusiastic response.
- Crude oil production in 1957 rose above the 1950 (pre-nationalization) level.
- Refinery throughput at Abadan increased by 34.7 percent over the previous year to 314,000 barrels daily.

**New law.** Purpose of the Petroleum Act of July 31, 1957, was to extend exploration, development and production of oil throughout Iran and the Continental Shelf outside the Consortium area of South Iran defined in the Agreement for the Sale of Oil of October 29, 1954. National Iranian Oil Company, the Iranian government oil agency, was authorized to make joint agreements with domestic and foreign groups. Such agreements are subject to the approval of the Council of Ministers and of the Iranian legislature, in that order.

NIOC may divide its territory into districts not exceeding 30,888 square miles, and declare such areas open for bids. NIOC would retain one-third of the exploitable area, including the Continental Shelf as National Reserve.

Thus, the new Iranian law allows foreign companies to enter the country, provided they accept NIOC as

See Insert Map

at least a minority-interest partner, and will subject themselves to the Iranian tax code, among other conditions.

**ENI-NIOC.** In the spring of 1957, a contract was concluded between the Italian oil monopoly Ente Nazionali Idrocarburi and NIOC for 8,880 square miles of concessions in three tracts outside the Consortium area. After ratification by the Iranian government, the concessions became official. The first tract is located north of Abadan in the Zagros Mountains; the second is in Mekran Province along the Pakistan frontier and the Gulf of Oman; and the third is located offshore in the upper Persian Gulf from Bandar Shapour to Bandar Abbas.

The capital of the new joint ENI-NIOC concern is split 51-49 in NIOC's favor. Societe Irano-Italienne des Petroles (SIRIP) is the new firm's name.

**Other applicants.** Many large firms, including Standard Oil Company

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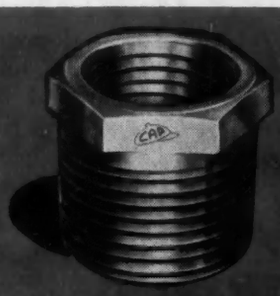
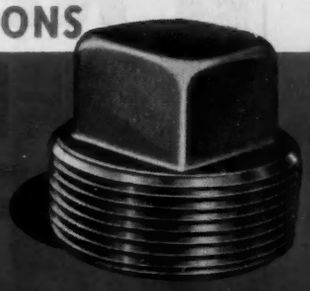



F.S. Hex Bushings



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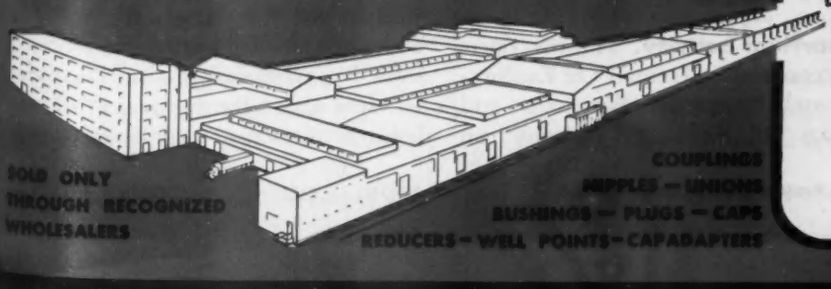

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(New Jersey) and independents in the U. S., Canada and Japan were known to be interested in acquiring new concessions under the 1957 law. On November 2, NIOC declared District I, including offshore Persian Gulf areas, located west of 50° 30′ East longitude, to be open effective Feb. 1, 1958, and invited bids. Fifty-seven companies from 10 different nations obtained questionnaires; 22 returned completed forms.

NIOC considered 11 of these firms to be fully, and 10 relatively, competent. Applicants were advised of results, with successful preliminary bidders being told to apply for necessary documents and submit tenders before the end of March. Six proposals from 10 different companies were on hand on March 31, and Pan American Petroleum Company was the winner.

Last December 2, NIOC also declared open, effective March 1, 1958, Districts III and IV. Both include parts of the Continental Shelf and territorial waters as well as the mainland, south of 27 degrees north latitude. District II lies between 57° 5′ 24″ and 59° 25′ of east longitude, and District IV is located between this same meridian and the Pakistan frontier.

**Pan American agreement.** The joint venture agreement between NIOC and Pan American Petroleum Corporation, subsidiary of Standard Oil Company of Indiana, was signed April 24, 1958, and ratified about six weeks later by the Iranian government. It pertains to District I, in the Persian Gulf. With certain exceptions, NIOC and Pan American agree to participate equally in the venture.

Iran Pan American Oil Company (IPAC) is the name of the new corporation formed by the joint venture. After five years, the concession area is to be reduced by 25 percent and reduced again by the same proportion at the end of the second five years. If no commercial production is found at the end of the twelfth year, the area reverts to NIOC, and the contract is void. If commercial production is attained at that time, only the productive area is retained by the two parties.

**Consortium activity.** The two operating companies, Iranian Oil Exploration and Production Company and Iranian Oil Refining Company run the Iranian oil industry in the area of South Iran reserved to the Consortium, composed jointly of 14 U. S. companies, Royal Dutch Shell, The British Petroleum Company, Ltd., and Compagnie Francaise des Petroles. The Consortium setup was fully described in the International Outlook Issue Iran reports in WORLD OIL in both 1957 and 1956.

Crude oil production, led by the huge Agha Jari field, averaged 716,000 barrels per day in 1957, representing a 33.7 percent increase over the daily rate of 534,375 barrels in 1956, and 7.8 percent more than the 664,300 barrels daily figure recorded in 1950, the last pre-nationalization year.

Seven field wells were completed during 1957, with two wells being completed in Naft Safid for 7,500 barrels daily each from 6,000 feet. A deep test, Gach Saran 12, was drilled to 10,550 feet and completed as an oil-water contact observation well in July, 1957. Agha Jari 30 proved to be a significant northwest extension to the field, where two other wells, Agha Jara 47 and 48, were brought in for 24,000 and 40,000 barrels daily, respectively, during the year.

Crude oil production during the first three months of 1958 in South Iran averaged 816,000 barrels per day.

Three additional rigs were put into service in 1957. Eight rigs were operating in 1957, and a ninth was to go into service during 1958. Three rigs were to be working at Agha Jari, three at Gach Saran, and one at Naft Safid, for development drilling. Two others were to work on wildcats, at Kuh-i-Binak and at Ahwaz.

**Exploration.** Ahwaz 5 was drilled to 12,742 feet, a depth record for Iran, and abandoned late in the year. Ahwaz 6 was spudded on December 12. It resulted in the second major blowout in Iran within less than two years, and was brought under control by Myron Kinley, Houston firefighter, and his assistants. But it appeared that the first wildcat discovery in south Iran since 1938 had been made.

On June 4, Kinley detonated a 750-pound dynamite charge which extinguished the fire. Afterward, a jet of white gas and light condensate flowed from 9⅝-inch casing, rising to about 150 feet above the surface. Work was being continued to clear away enough

earth to expose sufficient undamaged casing on which to fix a control valve.

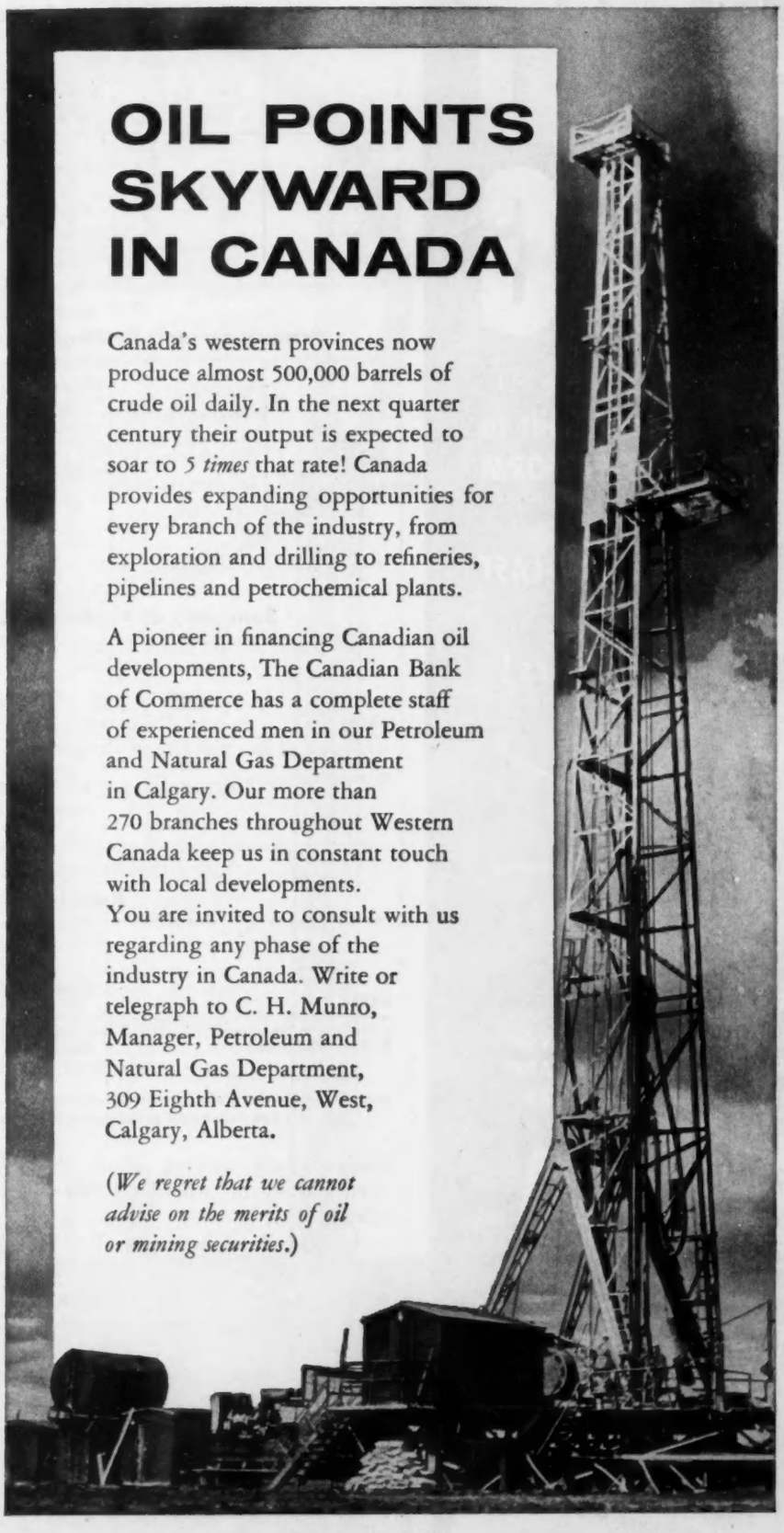
Exploratory efforts, renewed in South Iran in 1956 after being dormant since 1951, continued at a brisk pace in 1957. Eight field parties, two geological, three geophysical and three topographic, worked a sub-coastal strip about 50 miles deep and 800 miles long from Ahwaz in the north to Bandar Abbas in the south. A gravity-magnetometer crew was prospecting between Ahwaz and Abadan.

**Refining.** An average of 314,000 barrels per day was charged at Abadan refinery in 1957, representing a 34.7 increase over the 233,083 barrels daily run in 1956. Part of the big increase was due to the Suez crisis, when some other refineries competitive with Abadan were partially blocked from market areas. Throughput declined somewhat after the Canal reopened.

**NIOC activities.** NIOC produced a total of 1,853,469 barrels (5,078 daily) from Naft-I-Shah field on the Iraq border during 1957, from two flowing wells. Two other wells in the field were shut in as of the end of the year. There was no oil production from Alborz field, scene of a spectacular blowout at Well 5 in August, 1956. After the well had blown wild for two months, the casing in Alborz 5 collapsed, shutting the well in. Iran Oil Company, an affiliate operating for NIOC in the Qum region, had been unable to establish commercial production there by midyear 1958.

Alborz 6, a west stepout, was reported drilling at 10,817 feet at the end of December, having found a show of oil at about 8,750 feet, but without finding production. Alborz 7 was reported drilling at 6,332 feet at the same time. In April, 1958, Alborz 5A was ready to spud, about 800 feet east of Well 5. In addition, a test of the Saradjeh structure, also in the Qum vicinity, was being readied.

**Pipe lines.** The trans-Iranian products pipe line system continued to be expanded in 1958, following completion of the 10-inch line from Ahwaz to Teheran last year. Six pumping

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## Production and Drilling in South Iran in 1957

| Field | December 31, 1957 Total Number of Wells | Producing Wells | Workovers Completed In 1957 | New Wells Completed In '57 | Wells Drilling At End of '57 | Average Daily Production In 1957, bbls. | Total 1957 Production In Barrels | Percent Increase, 1957 As Compared to 1956 |
|---|---|---|---|---|---|---|---|---|
| Agha Jari | 36 | 22 | 3 | 3 | 3 | 450,000 | 164,250,000 | 21.1 |
| Haft Kel | 48 | 20 | 0 | 0 | 0 | 120,000 | 43,800,000 | 42.9 |
| Gach Saran | 15 | 4 | 0 | 1 | 2 | 48,000 | 17,520,000 | 269.2 |
| Naft Safid | 27 | 10 | 0 | 3 | 1 | 46,000 | 16,790,000 | 119.0 |
| Masjid-i-Sulaiman | 257 | 19 | 1 | 0 | 0 | 41,000 | 14,965,000 | 6.9 |
| Lali | 15 | 4 | 4 | 0 | 0 | 11,000 | 4,015,000 | 57.1 |
| Ahwaz | 5 | 0 | 0 | 1 | 1 | 0 | 0 | .... |
| Total | 403 | 79 | 8 | 8 | 7 | 716,000 | 261,340,000 | 33.7 |

## Production and Drilling Outside Consortium Area in 1957

| Field | Company Operating Field | 1957 Crude Oil Production, In Barrels | 1957 Production, Barrels Daily | Number of Crude Oil Producing Wells, End of 1957 Flowing | Shut In | Total | Wells Completed In 1957 | Wells Drilling as of 12-31-57 |
|---|---|---|---|---|---|---|---|---|
| Naft-I-Shah | National Iranian Oil Co. | 1,853,469 | 5,078 | 2 | 2 | 4 | 0 | 0 |
| Albors | Iran Oil Co. (for NIOC) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Mazandaran (South Caspian) | IOC for NIOC | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Total | | 1,853,469 | 5,078 | 2 | 2 | 4 | 2 | 2 |

## Summary of Production and Drilling in Iran in 1957

| AREA | Total Wells, 12-31-57 | Producing Wells, 12-31-57 | Wells Completed In 1957 | Wells Drilling, 12-31-57 | Average Daily Production, 1957, bbls. | Total Production 1957, In Barrels | Total Production In 1956, Barrels | Estimated Footage Drilled During 1957 |
|---|---|---|---|---|---|---|---|---|
| a. Consortium (South Iran) | 403 | 79 | 8 | 7 | 716,000 | 261,340,000 | 195,581,331 | 60,000 |
| b. Outside Consortium Area | 4 | 2 | 2 | 2 | 5,078 | 1,853,078 | 2,707,800 | 25,000 |
| Total | 407 | 81 | 10 | 9 | 721,078 | 263,193,078 | 198,289,131 | ..... |

## Refining in Iran in 1957

| AREA | Refinery Location | Name of Company Operating Refinery | Capacity of Refinery, in Barrels Daily | 1957 Daily Average Crude Runs to Stills, in Barrels |
|---|---|---|---|---|
| a. Consortium (South Iran) | Abadan | Iranian Oil Refining Company | 400,000 | 314,000 |
| b. Outside Consortium Area | Kermanshah | National Iranian Oil Company | 3,100 | 2,834* |
| Total | | | 403,100 | 316,834 |

* Light ends from crude topped at Naft-I-Shah Field plant.

stations were moving about 25,000 barrels daily of products to five terminals.

A 138-mile, 6-inch spur line from Azna to Isfahan was in partial operation in early 1958. At one point, this spur reaches an elevation of over 8,000 feet.

The spur from the Rey terminal, near Teheran, to Resht, near the Caspian Sea, was scheduled for early construction. The first 98 miles was to be 8-inch, the remainder (120 miles) 6-inch. One pump station at Rey was being designed to move about 8,000 barrels of products daily to four terminals en route to Resht.

A 26-28-30 inch crude oil pipe line was being planned from Gach Saran field 67 miles to the Persian Gulf coast above Ganeveh, continuing as a submarine line an additional 23 miles to Kharg Island, where a large tank farm and marine terminal were planned. It will have an initial capacity of 370,000 barrels daily.

It was planned to extend the 4-inch fuel oil line from Naft-I-Shah to Kalantar on to Kermanshah, a distance of about 100 miles. The 4-inch system would thus carry crude from Naft-I-Shah to the Kermanshah refinery, with the 3-inch line that now carries light ends to the refinery being converted to products.

A proposed major pipe line between the Qum area and the Turkish port of Iskenderun on the Mediterranean will not be built until such time as a major reserve may be proven in the Qum vicinity.

# Dallas Firm Claims World's Deepest Slim-Hole Pumper

The world's deepest slim-hole pumper — a 5,000-foot oiler in Cochran County's Buckshot field —was reported completed Monday by Stekoll Petroleum Company, Dallas.

The well, Stekoll No. 1 J. W. Frost, 7-W-PSL, eight miles south of Bledsoe, gauged 139.8 barrels of oil plus 75 barrels of water a day on pump from around 5,140 feet. Slim hole wells produce through 1-inch hollow rods set in 2½-inch casing as opposed to normal casing size of 5½ inches.

M. H. Stekoll, president of the firm, said economy is the primary motive behind the slim well procedure. Savings from such techniques have reached as much as one-half normal costs in shallow depths and one-third in others, Stekoll claimed.

Since 1942, when he began water flooding work in the Bolton field near Independence, Kan., Stekoll has pioneered slim hole production.

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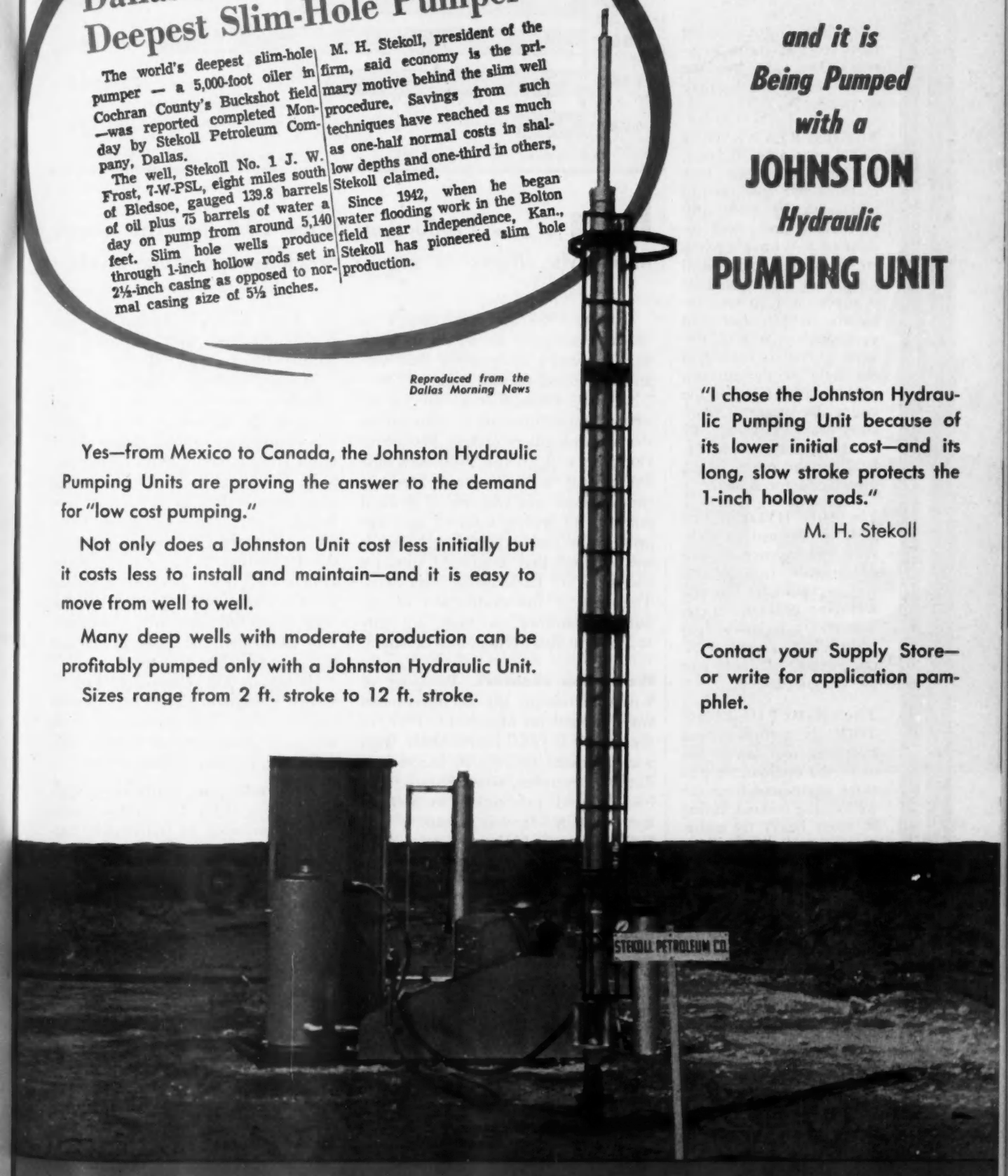


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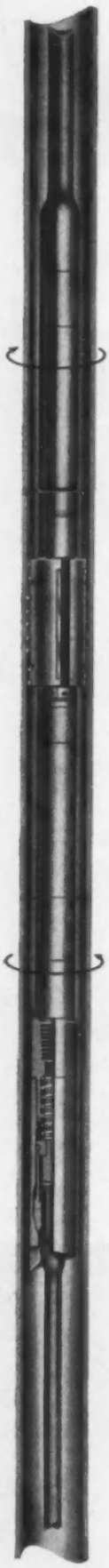

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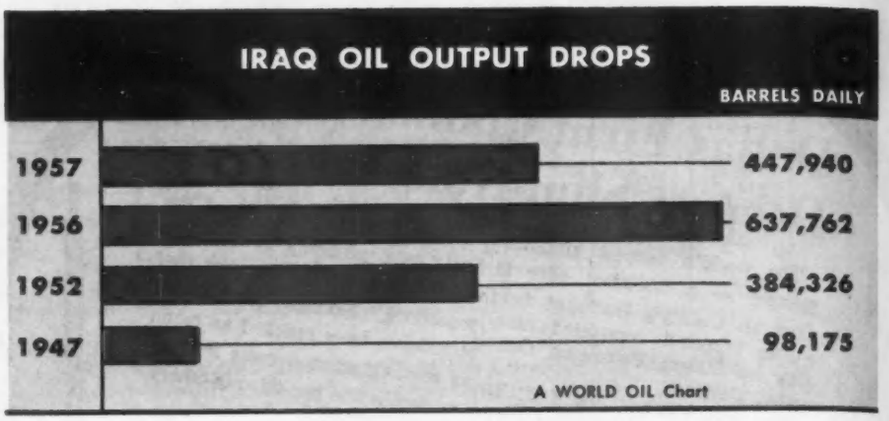



# Iraq . . . Production drops 29.8 percent despite industry's efforts to regain previous operating levels

DURING 1957 and 1958 Iraq's oil industry struggled to regain its position in world oil markets that was severely jolted on the night of Nov. 2-3, 1956, when Syrian troops detonated three pumping stations within the Syrian segment of Iraq Petroleum Company's 12, 16 and 26-32-inch pipe line system to the eastern Mediterranean. Last year was one of gradual recovery to within sight of previous production and export levels, but it was evident that Iraq's oil industry had been set back almost two years. The cost of the destruction of the pumping stations was high, not only to Iraq but also to Syria and Lebanon.

**Production recovers.** Pumping of Kirkuk crude to the Mediterranean was resumed on March 11, 1957, at the rate of 218,000 barrels daily. This was increased to 343,000 barrels per day by December, when Kirkuk field had boosted production to 358,126 barrels daily. It was expected that throughput could be increased to 500,000 barrels per day by mid-year 1958.

Crude oil production by Iraq Petroleum Company Ltd. and its two affiliates, Basrah Petroleum Company Ltd. and Mosul Petroleum Company Ltd., during the first three months of 1958 was approximately 56 million barrels, or about 622,000 barrels per average day.

**Concessions.** All Iraq territory remained completely under four 75-year concession. IPC maintained the most productive of the four, including almost all of Iraq's territory north of the thirty-third parallel and east of the Tigris River, including the huge Kirkuk oil field, over 50 miles long parallel to its structural axis.

Mosul Petroleum Company maintained its area west of the Tigris and north of the thirty-third parallel. Basrah Petroleum Company holds almost all of Iraqi territory south of this latitude. Ownership of these affiliated companies is divided as follows: The British Petroleum Company Ltd., 23.75 percent; Compagnie Francaise des Petroles, 23.75 percent; Royal Dutch Shell, 23.75 percent; Standard Oil Company (New Jersey) and Socony Mobil Oil Company, 11.875 percent each; and the estate of the late C. S. Gulbenkian, 5 percent.

Khanaqin Oil Company, Ltd., a British Petroleum subsidiary, operates the smallest Iraq concession (Naft Khaneh), producing oil from a field straddling the Iran frontier.

**1957 production.** Crude oil production during 1957 by all four companies amounted to 163,498,000 barrels, or 447,940 barrels per average day. The 1957 figure represents a 29.8 percent decrease from 1956, when the total also compared unfavorably with the previous year. However, it was clear from first quarter 1958 figures that, provided pipe line outlets can be maintained, 1958 production should be boosted to pre-Suez levels.

**Iraq Petroleum Company.** IPC produced 88,388,000 barrels of crude last year, all from Kirkuk field, for a daily average of 242,159 barrels. This was a 44.6 percent decline from the 1956 daily average of 437,221 barrels. Here again, however, the outlook was for the rate to be boosted

back up to previous levels during the latter part of 1958 with the pipe lines open.

IPC had four rigs in operation through March, 1957, but kept two plus an occasional third running during the rest of the year. Three oil producers, two gas wells and one observation well were completed during the year. Development of Bai Hassan and Jambur oil fields continued.

At the end of the year, IPC had 46 wells on production, at Kirkuk. Three wells were being drilled at that time. Total footage drilled during 1957 was 21,924 feet, representing a sharp 58.4 percent decline from 1956 when 52,802 feet was drilled.

**Basrah Petroleum Company.** Basrah continued to expand its output from South Iraq fields through exports from the Persian Gulf port of Fao. Production last year averaged 190,110 barrels per day for a total of 69,390,000 barrels. Thus, in 1957 as in 1956, Basrah Petroleum, unlike other producers in Iraq, enjoyed a substantial increase over the previous year, not being handicapped so much by isolation from deep water ports and overdependence on pipe line transportation.

The 1957 average represented a 9.1 percent boost as compared to the 1956 average of 174,198 barrels daily. All production was from two fields, Rumaila and Zubair, located in extreme southern Iraq near the Kuwait border. As the year ended, Basrah had 38 wells on production at Zubair and 19 at Rumaila.

Four oil wells and one dry hole were completed during the year. Two rigs were drilling from January to November, and a third entered service in December. Rachi 1, a wildcat test located 27 miles west of Rumaila, was abandoned as dry at 12,959 feet in April, 1957. Suhain 1, located farther north in the Amara vicinity, was spudded October 22 and had reached 5,279 feet by the end of December. Another wildcat, Musaiyib 1, commenced in December and reached 3,033 feet as the year closed.

Basrah Petroleum drilled a total of 61,846 feet of hole last year to run its cumulative footage up to 702,990 feet as of December 31. The 1957 total represented an increase of 57.8 percent over the 1956 footage of 39,200, though it fell short of the 71,821 feet drilled during 1955.

**Mosul Petroleum Company.** Of the four operating companies in Iraq, Mosul Petroleum Company Ltd., was the most severely hit by the sudden stoppage of pipe line outlets because its productive fields in extreme northwest Iraq are the most isolated of those that depend on export markets. Production from Ain Zalah and Butmah fields almost stopped during the first two months of 1957. After pumping of oil resumed in March, Mosul's production during that month was 179,285 barrels. The year's total came to 4,176,000 barrels, or 11,441 barrels per average day.

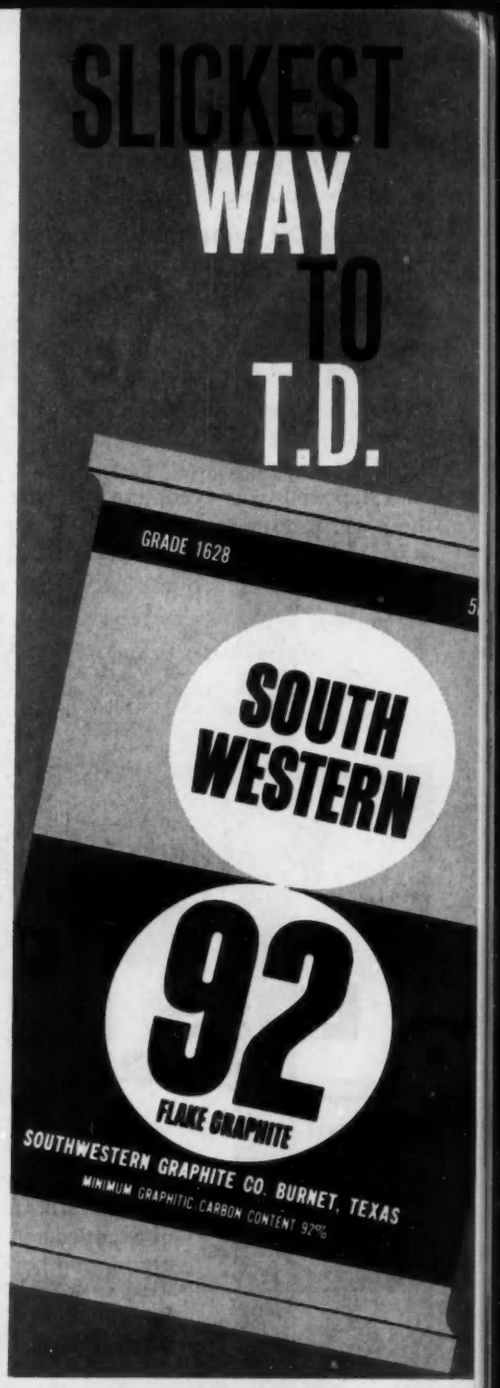
Nevertheless, exploration continued at a brisk rate. A rank wildcat, Tharthar 1, located 110 miles northwest of Baghdad, spudded in 1956, was abandoned at 12,610 feet in August, 1957. Two other wildcats in the far northwest at Gullar and Ibrahim were abandoned, the first in February at 10,148 feet, the second at 10,776 feet in November. Fallujah 1, located west of Baghdad, was spudded August 24 and reached 9,077 feet at the end of 1957. The well encountered extremely heavy, viscous crude in non-commercial quantities at 9,440 feet.

Mosul Petroleum later announced commencement of a wildcat on the Anah structure in Dulaim Liwa.

In addition to the three dry holes finished during the year, one oil well was completed, and another well was drilling in Butmah field at the end of December. Nine production wells were listed at Ain Zalah and seven at But-

**Oil Operations in Iraq in 1957**

| Name of Company | Crude Oil Production In 1957, In Barrels | Barrels Per Day | Number of Producing Wells at Dec. 31, 1957 | COMPLETIONS | | | | Wells Drilling, at Dec. 31, 1957 | Total Footage Drilled, 1957 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Oil | Gas | Dry | Total | | |
| Iraq Petroleum Co. Ltd... | 88,388,000 | 242,159 | 46 | 3 | 2 | 1 | 6 | 3 | 21,924 |
| Basrah Petroleum Co. Ltd. | 69,390,000 | 190,110 | 57 | 4 | 0 | 2 | 6 | 3 | 61,846 |
| Mosul Petroleum Co. Ltd. | 4,176,000 | 11,441 | 16 | 1 | 0 | 3 | 4 | 2 | 24,224 |
| Khanaqin Oil Co. Ltd..... | 1,544,000 | 4,230 | 3 | 1 | 0 | 0 | 1 | 0 | 3,402 |
| Total ..... | 163,498,000 | 447,940 | 122 | 9 | 2 | 6 | 17 | 8 | 111,396 |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mah as of the end of 1957. Mosul drilled 24,224 feet during the year, down 33.9 percent from the 36,657 feet drilled during 1956.

**Khanaqin Oil Company.** Production by Khanaqin Oil Company Ltd., from Naft Khaneh field was put at 1,544,000 barrels, or 4,230 barrels per day, down slightly from the 1,700,000 barrels (4,645 per day) estimated for 1956. Three oil wells were reported producing at the end of 1957, all flowing. One gas well was reported shut in. One well was completed during the year, resulting in an oil producer in the Kalhur limestone. Total depth was 3,402 feet.

**Government oil revenues.** During 1957, the Iraq government earned $136.9 million in revenues from the oil industry, a 29 percent decrease from the $192.9 million received during 1956 from the same sources. As a result, some of the government's ambitious plans for highway construction, petrochemical plants, natural gas transmission lines etc. were delayed and/or postponed. However, considerable progress was being made with the government's program of promoting industrial activity through use of its oil revenues.

**Pipe line projects.** Iraq's most pressing economic problem continues to be lack of pipe line outlets for its isolated oil fields. Needs for continuous expansion of Basrah Petroleum Company's Persian Gulf loading facilities have caused the company to make plans for a $3 million offshore loading terminal near Fao.

IPC had made plans to loop its Iraq-Syria-Lebanon system to effect a large-scale increase of crude throughput from Kirkuk, Ain Zalah, and Butmah fields to the eastern Mediterranean. However, there was doubt that the pumping stations in Syria would be restored to their pre-Suez capacity, the general plan being to provide all increased pumping capacity in Iraq.

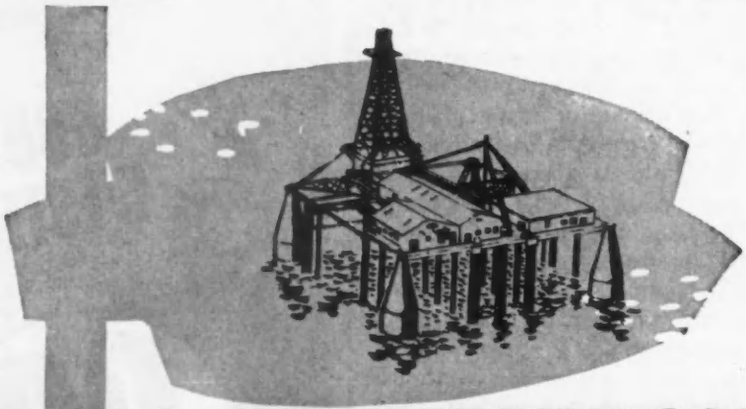
Recent strife in Lebanon, which caused damage to 12- and 16-inch IPC pipe lines on May 12, stressed the danger inherent in maintenance of major pipe lines in this part of the world. Damage in this instance was minor, and the lines were back in operation after repairs by May 15.

A new 24-inch pipe line loop from Homs to Banias in Syria was reported under construction in May, 1958.

It was too early to assess the impact of the Iraq-Jordan federation, which was ratified by voters in Iraq in May, 1958. Early in March, Iraq began supplying Jordan with oil products from the Daura refinery. However, merger of the two countries could not be expected to have an adverse affect on pipe line matters. Since Jordan has no Mediterranean port, however, it is not as strategic an area pipe line-wise as Syria and Lebanon.

On Oct. 16, 1957, Standard Oil Company (New Jersey) announced that the oil industry's plans to build an $800 million Middle East pipe line with its terminus at Iskenderun, Turkey, had been indefinitely postponed by the Turko-Syrian political crisis. In view of the fact that the crisis was fabricated entirely by Russian and Syrian propagandists, a strong suspicion arose that one of the purposes of this campaign was to kill the pipe line project.

Meanwhile, Basrah Petroleum Company, enjoying relative freedom from the snarls of international politics, prepared to enlarge transit facilities through construction of an island terminal at the head of the Persian

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Gulf about 16 miles offshore, and 27 miles from the port of Fao. The island would lie west of the Gulf-Shatt-al-Arab shipping lane. The island was to have a pier at each end to accommodate supertankers, each pier to be extended if necessary.

The schedule called for work to be completed by the middle of 1960. Two 32-inch submarine loading lines would be laid to permit about 175,000 barrels to be loaded at the new terminal daily in its initial stage of completion, in addition to similar loading capacity being utilized at the port of Fao.

See Insert Map

**Litigation.** A four-year-old suit by the Iraq government against IPC was reported resolved during 1957 by a $19.5 million settlement. However, the government disputed a 5 cent-per-barrel price cut by Basrah during 1956 and said it would refer IPC's 1956 accounts to arbitration for that reason. The matter is interesting particularly in view of the fact that two of the U. S. firms with partial ownership of IPC were under investigation by the U. S. government for raising prices early in 1957, yet were, by association, involved in difficulties with the Iraq government for cutting prices.

# Israel . . .

## Crude production climbs

ISRAEL'S OIL industry, now more mature and better balanced since discovery of the Heletz oil field in 1955, was in a state of transition by mid-1958. Heletz was essentially drilled up. Brur field, a 1957 discovery two miles south of Heletz, appeared to be about a six-well field. Several wells at Heletz had begun producing salt water, indicating partial depletion, but also suggesting existence of a

See Insert Map

partially effective water drive in the field. The threatened blockade of the Gulf of Aqaba by neighboring Arab states failed to materialize, and pipe line facilities between Elath to the Mediterranean coast were in use and were being expanded.

**Production.** Crude oil production rose to 400,000 barrels (1,096 barrels

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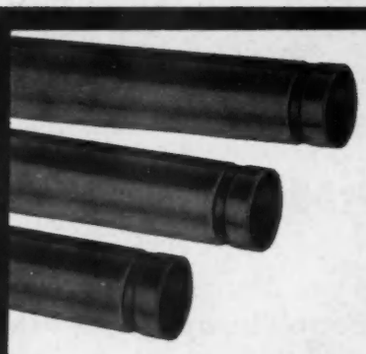

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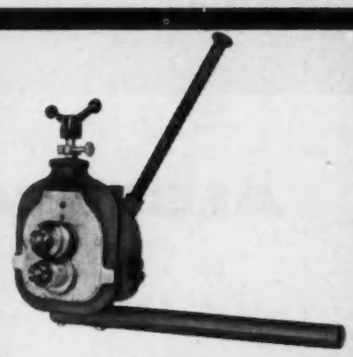

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daily) during 1957, including 370,000 barrels (1,014 barrels daily) from Heletz field, and 30,000 barrels (82,- barrels daily) from Brur field.

Brur 2, the discovery well, came in during June, 1957, for 280 barrels of oil on ⅛-inch choke from 5,000 feet in Nubian sandstone. A second successful producer, Brur 3, was shut in as of December 31. Crude oil production from Heletz field in 1957 was more than double the 151,000 barrels (or 414 barrels daily) reported for 1956.

By April, 1958, Brur 5 had been completed for a significant southward extension of the field. However, one geologist noted that the pay sand was missing almost entirely at Brur 1, a dry hole high on structure. The pay sand tends to thin to the west, and, at Heletz 4, there was only 4 feet of it present. Hence, unless there are other pays to be found at Brur, it was likely that production would be restricted to the east flank of the structure.

Production from Heletz and Brur fields was being maintained at about 1,300 barrels daily late in 1957. Some of the wells at Heletz, particularly the west flank wells and/or those on pump, had begun to produce too much salt water to allow the oil to be acceptable at the pipe line. Desalting equipment was being installed or ordered during 1958.

**Drilling.** Drilling rates were maintained during 1957, totaling 136,044 feet, slightly more than the 135,557 feet recorded during 1956. However, stratigraphic and core drill work was reduced drastically, amounting to only 19,890 feet as compared with the 1956 total of 138,522 feet.

Three wildcats were being drilled at the end of 1957, and it was expected that three or four rigs would be in continuous operation during 1958. One heavy drilling rig had been sent to Europe with an Israeli crew, and negotiations were under way for contract work for two more rigs. At the peak of Heletz field development in 1956, 12 rigs were operating in Israel.

**Other exploration.** Hopes for commercial natural gas production in Israel were raised during 1957, when a test about 11 miles south of Heletz field near Beeri, drilled by Lapidot Israel Petroleum Company and Israel Oil Prospectors blew out and caught fire on August 16. The fire had been extinguished by August 29. After normal operations were re-established, the gas zone was cemented off and the well drilled deeper in search of oil.

**Production and Drilling in Israel in 1957**

| FIELD | Crude Oil Production During 1957 in Barrels | 1957 Prod. in Barrels Daily | No. of Wells Completed in 1957 | | | |
|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total |
| Heletz.. | 370,000 | 1,014 | 6 | 0 | 2 | 8 |
| Brur.... | 30,000 | 82 | 2 | 0 | 1 | 3 |
| Total | 400,000 | 1,096 | 8 | 0 | 3 | 11 |

In the Dead Sea area, Lapidot had suspended its Sdom test at 9,027 feet, after having penetrated an evaporite section throughout most of the hole.

West of the Dead Sea, Naptha Israel Petroleum Corporation found oil shows at Zohar 1 and was drilling ahead below 4,846 at the end of December. Just west of Jerusalem, Yehuda Israel Petroleum Company reported oil shows in Jurassic beds at Motza 1, and expected to move in a larger rig after suspending drilling at 4,606 feet as the year ended. In March, 1958, Israel Continental Oil Company was reported to have found

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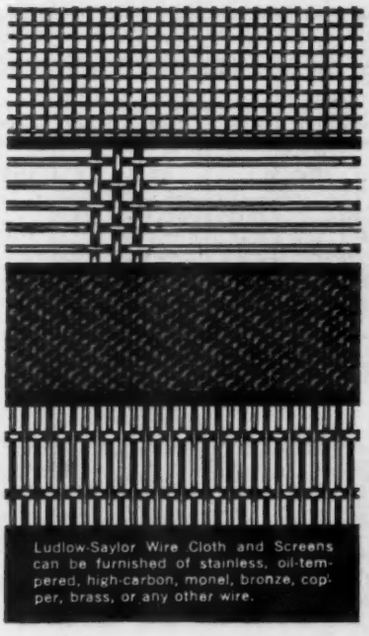
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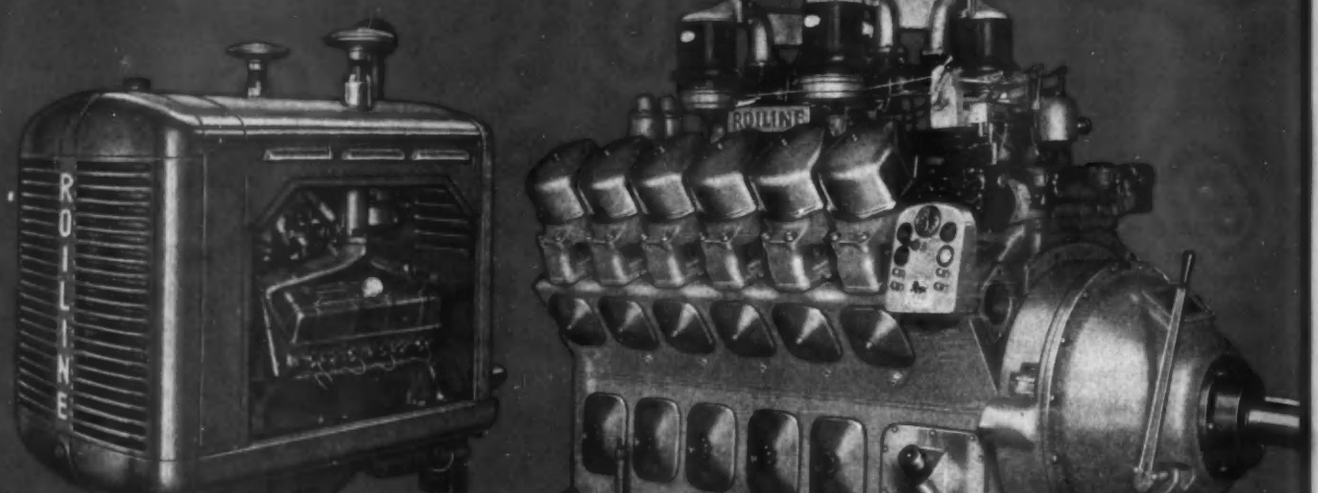


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| | | | | | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 |
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oil below 2,500 feet at Mount Tabor, in Lower Galilee.

However, primary interest remained in the coastal areas, and in the Beeri-Heletz-Negba trend of gravity anomalies. Heletz 22, a deep field wildcat, was drilled to 9,738 feet by the end of 1957, and a larger rig rated to 15,000 feet was being acquired in 1958 to carry the well deeper.

**Geophysical activity.** The government-run Geophysical Institute continued seismograph work during 1957. A total of 17 party months was completed in Israel during the year.

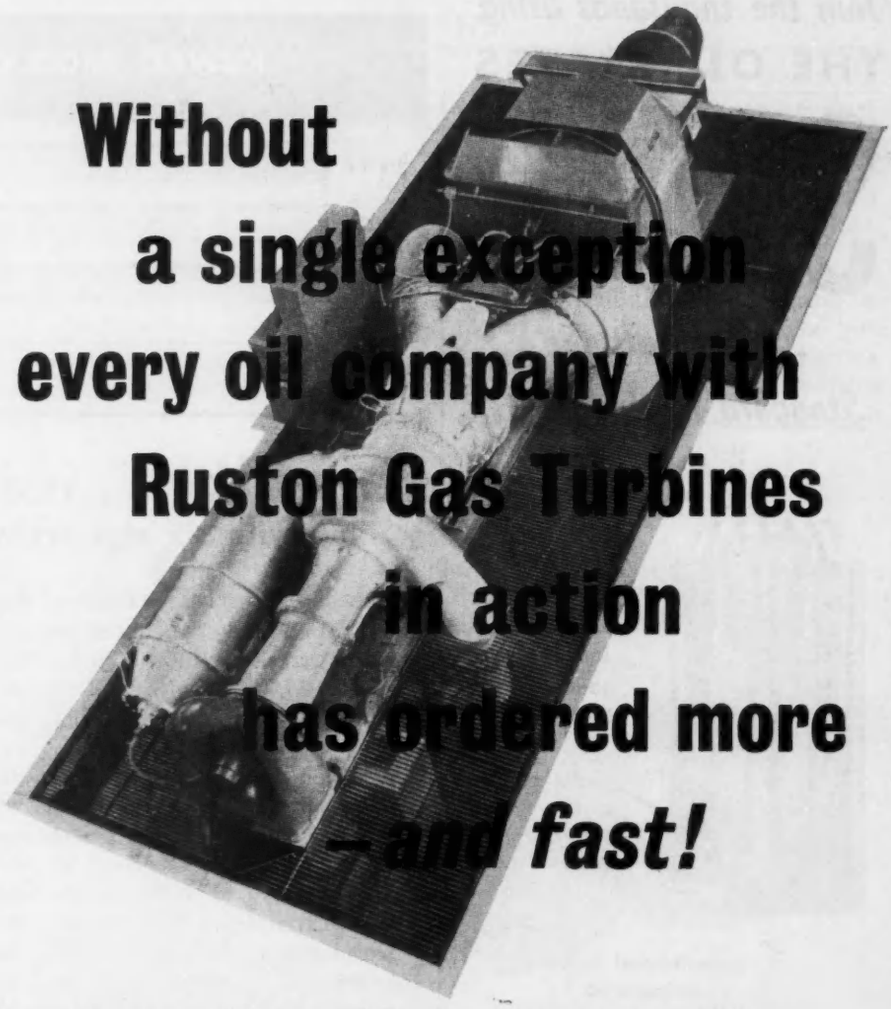
**Concessions.** The brief Suez war in 1957 slowed applications for new concessions. At the year's end, 34 petroleum licenses were in force, divided among seven foreign and three Israeli companies with foreign capital.

The formation of a public national Israeli company was underway in 1958. It would expect to raise operating capital within Israel, and to begin exploration of about nine new licenses spread throughout the country.

**Pipe lines.** The 150-mile, 8-inch crude oil pipe line from the port of Elath on the Gulf of Aqaba to Beersheba was completed in April, 1957. It continued to operate at its 20,000 barrels daily capacity in early 1958. A 16-inch extension of the line from Beersheba to the Mediterranean Coast, about 20 miles south of Tel Aviv, was completed a year ago. In April, 1958, a 16-inch spur to Haifa was being completed to link the Haifa refinery with Elath.

**Imports and consumption.** Israel's oil production, still small compared to domestic demand, is supplemented by imports from the Caribbean area, and increasingly so by oil shipments entering at Elath. The rapid increase in Israel's oil consumption evident during recent years was slowed somewhat in 1957 by the Suez war. Oil consumption amounted to about 28,000 barrels daily during 1957, representing an increase of 4.6 percent over the 1956 figure. The 1958 rate was expected to increase about 8 percent as compared with 1957.

**Refining.** Consolidated Refineries Limited charged an average of 26,000 barrels per day at the Haifa refinery during 1957. The plant's capacity is 87,000 barrels daily.

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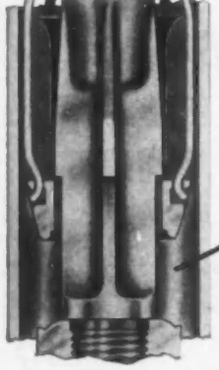

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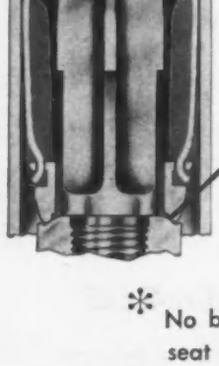

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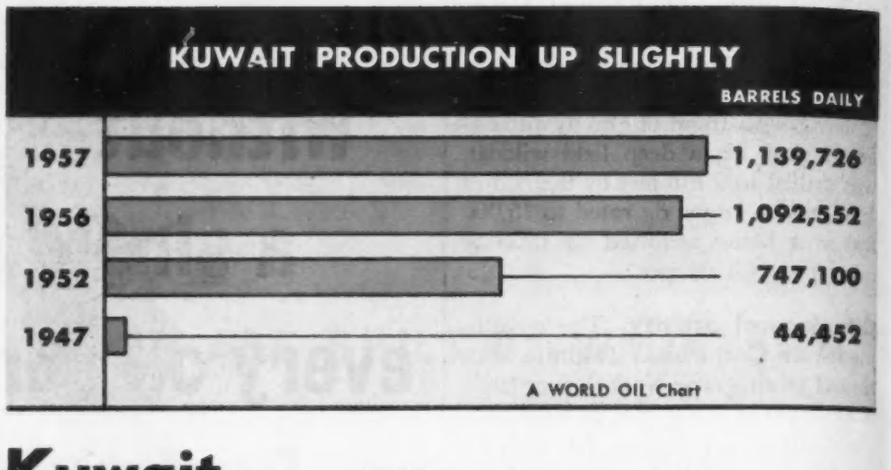



# Kuwait . . . 1958 development drilling continuing with six rigs active

ORDERLY DEVELOPMENT along the lines of previously-announced expansion programs was the rule in Kuwait during 1957 and early 1958. Crude oil production was increased to 416 million barrels, an average of 1,139,726 barrels daily, representing a 4.32 percent boost over the 1956 rate of 1,092,552 barrels per day. Refinery expansion program at Mina al Ahmadi continued on schedule and was partially completed in 1958.

Development drilling continued in the Ahmadi-Magwa-Burgan productive area, with six rigs active on field wells at the end of 1957. By early 1958, Raudhatain field had been extended considerably, and unquestionably represented a major reserve. Of the development wells, 37 were completed in Burgan field, 4 at Magwa, and 7 at Ahmadi, during 1957.

The Suez crisis apparently had no effect on 1957 production figures in Kuwait, though tanker loadings were decreased drastically for a short period late in 1956. Since The British Petroleum Company Ltd. and Royal Dutch Shell (the latter through long-term contract with Gulf Kuwait Ltd.) take most of Kuwait's crude output, and both companies have large tanker fleets, Kuwait was not affected so severely by the Suez crisis tanker shortage as other countries depending more heavily on non-oil company tanker fleets to move crude to markets.

Average daily crude production in Kuwait during the first four months of 1958 ran about 1,360,000 barrels per day.

But as current expansion programs advanced toward completion, new ones were announced to continue the brisk pace of oil expansion in Kuwait, now the world's third-ranking oil producer nation after the U. S. and Venezuela. In addition to the six development rigs, two more drilling outfits were at work in north Kuwait at the end of 1957, and a workover rig was reported active in completing and testing new Raudhatain field wells.

Though only one extension well, Raudhatain 2, located 1.8 miles southeast of Raudhatain 1 (completed in 1955), was officially listed as completed in this area as of the end of 1957, a total of ten wells capable of oil production were reported in Raudhatain by the spring of 1958.

Raudhatain is located about 50 miles north and slightly west of the north end of Magwa field. The indicated minimum north-south length of the field at that time was 5½ miles, the indicated width 3¾ miles from east to west. Thus, a field underlying at least 13,000 acres is envisioned. A net thickness of 1,500 feet of effective oil sands in the Burgan and Zubair sandstone zones was reported from 7,370 to 10,300 feet, with separate water levels being found in different sands.

If these sand zones are as productive on a per-acre-foot basis as may be reasonably expected from productive characteristics experienced elsewhere in this particular trend, a likely reserves figure of 9.75 billion barrels can be calculated for Raudhatain.

Raudhatain field is expected to go on production next year, when a 30-inch pipe line will link the field with marine terminal facilities at Mina al Ahmadi, about 70 miles to the south. The wells were thought to be capable

## Oil Operations in Kuwait in 1957

| Name of Company | Crude Production During 1957 In Barrels | 1957 Prod. in Barrels Daily | 1956 Production In Barrels Daily | Increase, 1957 Over 1956 Daily Rate, In Per Cent | Number of Crude Oil Producing Wells, End of 1957 | | | | DEVELOPMENT DRILLING IN 1957 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Number of Field Wells Completed During 1957 | | | | Number Drilling on 12-31-57 | Footage Drilled, Field Wells 1957 | Number of Field Wells Drilling, 12-31-57 |
| | | | | | Flowing | Pumping | Shut | Total | Oil | Gas | Dry | Total | | | |
| Kuwait Oil Company Limited..... | 416,000,000 | 1,139,726 | 1,092,552 | 4.32 | 234 | 0 | 33 | 267 | 48 | 0 | 0 | 48 | 6 | 222,600 | 6 |

of 5,000 barrels-per-day oil production each, or better. Kuwait Oil expected to have about 20 wells initially producing about 100,000 barrels daily by the end of 1959, figures that might be doubled by the end of 1960.

In other exploratory drilling, Sabriya 1, located 7 miles due southeast of Raudhatain field, was completed as an oil producer, with total depth below 8,450 feet.

Bahra 2, located 10½ miles south of Sabriya 1 and about 8 miles inland from the north shore of Kuwait Bay, was drilled to 8,488 feet with 7-inch casing cemented at 7,789 feet and shut in by early 1957. The well was reported as an oil producer, but no further drilling on the Bahra structure had been done at the close of the year.

Matriba 1, a rank wildcat 30 miles west and slightly south of Raudhatain field, was drilling at the end of 1957. It later was reported a dry hole, the fourth failure drilled in Kuwait, as compared with 275 producers at the time.

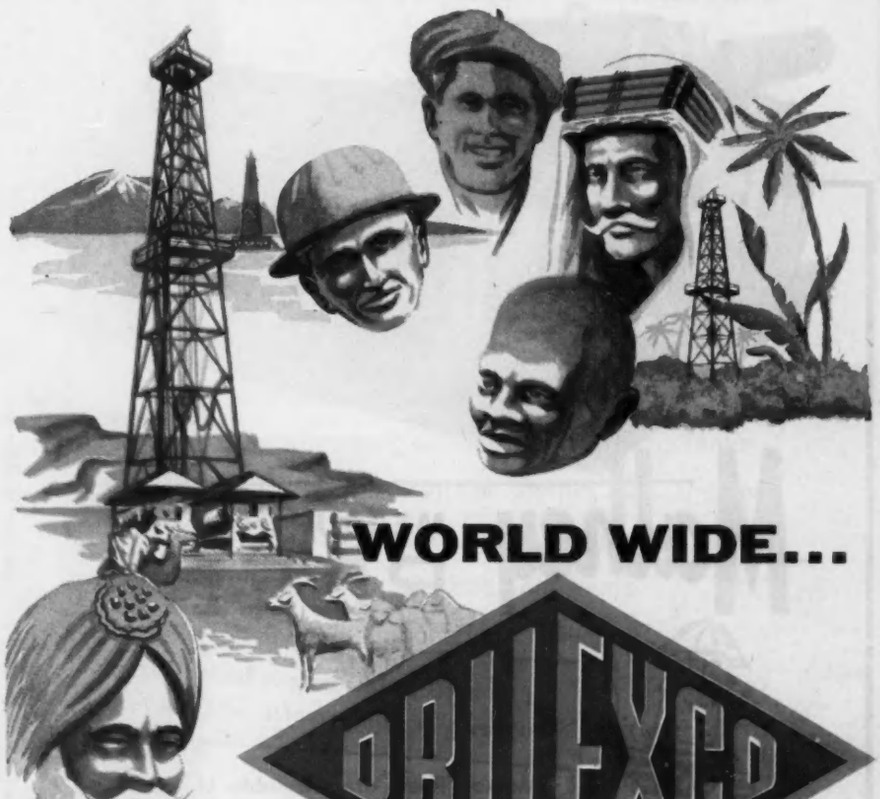
See Insert Map

**New Facilities.** Tanker-loading facilities were being expanded early in 1958 at Mina al Ahmadi, now the world's largest crude oil loading terminal (WORLD OIL, December, 1957, Kuwait Oil Loading Facilities Being Expanded, Page 184).

Prior to expansion, Mina al Ahmadi loading facilities consisted of an oil pier with eight loading berths and five sea berths, the latter consisting of two submarine lines to each berth. Four additional submarine pipe lines were being launched to form two new submarine berths. The first two submarine lines were launched May 11, 1957, one a 25-inch, 7,300-foot line for exporting fuel oil produced in new topping units at the refinery; the other, a 12-inch line for marine diesel. The second set of two lines was launched later in the year.

These projects boosted the terminal's loading capacity to about 1.5 million barrels daily, and also provided for loading of fuel oils as bunkers to tankers or as cargoes.

A new installation, the North Pier, will be built four miles north of the existing steel pier that extends 4,140 feet into the open sea at Mina al Ahmadi. Pipe lines and connections to tankers will allow loading rates up to 50,000 barrels per hour. The pier head is to be in 55 to 60 feet of water, about 6,000 feet offshore. Cost of the new pier and attendant facilities is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estimated at $22.5 million. It is intended to handle 100,000 dwt tankers or larger.

**Refining.** Kuwait Oil Company's Mina al Ahmadi refinery continued to run at about its former 30,000 barrels daily capacity. An average of 27,000 barrels per calendar day was run to stills during 1957.

In March, 1958, two new distillation units were commissioned by the Shaikh. With these units in operation, the Mina al Ahmadi refinery made a huge 160,000 barrels-a-day jump in capacity.

# Neutral Zone . . . 54 wells completed for Middle East record; output rises 97.9 percent

SPECTACULAR STRIDES were made during 1957 and early 1958 in the oil industry of the Saudi Arabia-Kuwait Neutral Zone:

- Crude oil production in 1957 was 97.9 percent greater than in 1956, with Eocene production showing a significant proportion (11.6 percent) of the total for the first time.
- Two refineries were being constructed to process Neutral Zone crude.
- Fifty-four wells were completed, more than in any other country in the Middle East during 1957.
- A large extension area to the west of current production in Wafra field appeared to await development for Eocene possibilities and rapid shallow development drilling continued.

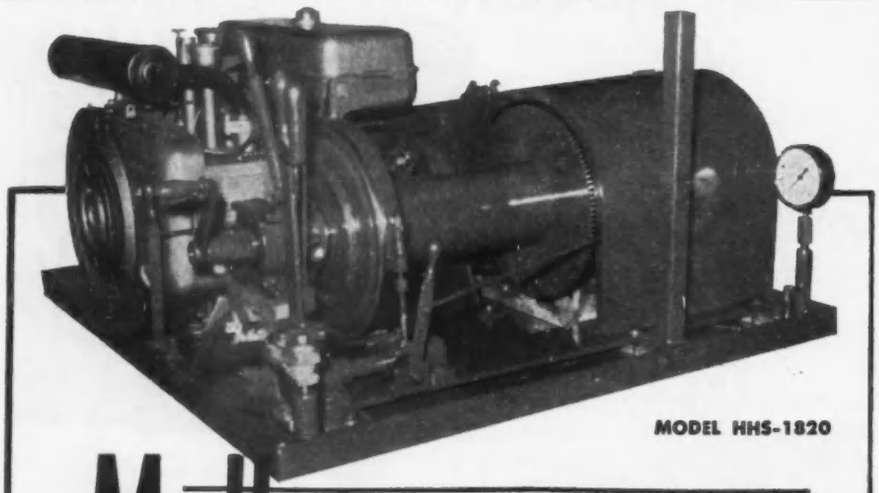
These rapid strides, signaling greater Middle East oil activity, tended to be obscured by the news of the granting of offshore rights in the Persian Gulf in Neutral Zone waters to a Japanese firm. This interesting pact promised to effect rapid development of Persian Gulf offshore oil prospects, as competition for remaining open acreage in the Middle East became more intense.

See Insert Map

**Japanese pact.** An agreement on the part of the Saudi Arabian government and Japan Petroleum Trading Company Ltd. was signed at Riyad, Saudi Arabia, Dec. 10, 1957. The pact conveyed the oil and gas rights covering Saudi Arabia's undivided one-half interest in the offshore of the Neutral Zone to the Japanese firm. The agreement regarding Kuwait's one-half interest was reported reached, after lengthy negotiations, in May, 1958.

The exact area covered by the agreement was not described because Middle Eastern nations had yet to agree specifically on the apportionment of submerged lands in the Persian Gulf to countries bordering on its shores. However, Kuwait Oil Company's concession in Kuwait extends to 6 miles beyond low-water mark from the coast, by agreement with the government. Hence, a similar margin should apply to offshore concessions in the Neutral Zone.

Japan Petroleum Trading Company Ltd. was granted a two-year exclusive petroleum exploration license. A two-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## Oil Operations in the Neutral Zone in 1957

| Names of Operating Companies | Crude Oil Production in 1957, in Barrels | Barrels Per Day | 1957 Crude Oil Production by zones, in Barrels | | | Number of Crude Oil Producing Wells at End of 1957 | | | | Number of Wells Completed in 1957, by Zones | | | | | Total Footage Drilled During 1957 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Eocene | Burgan Sand | Ratawi oolite | Flowing | Pumping | Shut in | Total | | Oil | Gas | Dry | Total | |
| American Independent Oil Co. and Getty Oil Co..... | 23,200,000 | 63,562 | 2,700,000 | 17,200,000 | 3,300,000 | 99 | 0 | 0 | 99 | Eocene | 37 | 0 | 8 | 45 | 110,390 Total footage in exploratory drilling during 1957 |
| | | | | | | | | | | Burgan | 3 | 0 | 0 | 3 | |
| | | | | | | | | | | Ratawi | 6 | 0 | 0 | 6 | |
| | | | | | | | | | | Totals | 46 | 0 | 8 | 54 | None |

year extension may be granted at the end of the primary term at the government's discretion and if drilling obligations have been met. The company must drill to a depth of 10,000 feet or shallower commercial production.

If commercial production is found, the government is to grant the company a 40-year development lease.

If oil is found, a royalty equal to 20 percent of crude oil produced from Saudi Arabia's half interest will be paid yearly, in cash or in kind at the government's option. The $1.5 million annual rental is deductible from royalty payments. A 20 percent royalty applies to natural gas also.

The government has the right to supervise the posting of prices. Posted prices will not be less than those current in the Persian Gulf area for crude oil and refined products of similar qualities and gravities.

Conditions exacted by the Shaikh of Kuwait in the agreement reported signed in May generally are similar to the Japanese-Saudi contract. However, the Kuwait government was to receive 57 percent of profits pursuant to its half-interest.

**Offshore prospects.** Prospects in the area offshore from the Neutral Zone are considered excellent. Obviously, there is to be vigorous drilling activity. The possibility that the Safaniya oil field may extend into the offshore Neutral Zone area has been acknowledged. The north limit of this huge Persian Gulf offshore field had yet to be determined as of mid-1958. It produces from Cretaceous sandstones above 6,000 feet of depth.

**Onshore activities.** American Independent Oil Company, composed of a group of 10 independent U. S. oil producers, holds, in behalf of itself and Getty Oil Company, a concession covering Kuwait's half interest in the onshore part of the Neutral Zone. Getty Oil Company holds the concession covering Saudi Arabia's half interest in the Zone.

Crude oil reserves were estimated at 5.4 billion barrels at the beginning of 1958. Substantial increases of reserve computations, particularly in

the Deep Ratawi oolite (Jurassic), account primarily for the abrupt rise.

Crude oil production during 1957 totaled 23,200,000 barrels, for an average of 63,562 barrels per day. Production was running at about 112,000 barrels daily as the year ended. The 1957 total was almost double the 11,724,585 barrels produced in 1956. Of the total, 17.2 million barrels, or 74 percent, was from the Burgan sands. Because of stepped-up shallow drilling rates, 37 oil wells and 8 dry holes were completed in the Eocene. Combined with 3 oil completions in the Burgan and 6 more in the Ratawi, the 1957 completion total came to 54, with 110,390 feet of hole being drilled during the year.

Four wells were being drilled as of December 31. There were 99 oil wells on production at the year's end, all flowing. No exploratory drilling was done in 1957.

It appeared that considerably more shallow drilling would be required to define the western limits of the Eocene reservoir. In addition, a second Eocene pay had been reported. What with expanded pipe line capacity and newly-constructed refining facilities existing in the Neutral Zone, the outlook for greatly-expanded production from Wafra field was bright.

**Pipe Lines.** Aminoil's expansion program was begun during the late fall of 1957. A second crude oil pipe line, 12 inches in diameter, was built from the Wafra gathering center to the Mena Abdulla marine terminal 34 miles to the northeast in Kuwait. Arabian Bechtel Corporation was the contractor for the pipe line, as well as for a new refinery, submarine loading lines and new gathering center facilities. Considerable tankage was added at the Wafra gathering center. Desalting capacity has been tripled. Storage capacity at the Mena Abdulla terminal was expected to be increased to 855,000 barrels including tankage under construction.

Getty Oil Company expected to complete a 31-mile, 18-inch crude oil pipe line early in 1958 to connect Wafra field with a new 50,000 barrel-a-day crude oil topping and stabilization plant being completed at Mina Saud, east of Wafra field on the Persian Gulf. Getty Oil completed three 40,000 barrel storage tanks, six

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10,000 barrel tanks, and one 125,000 barrel tank at Wafra field, with attendant lines and transfer equipment.

**Refining.** Aminoil's new refinery located at Mena Abdulla in Kuwait, just south of Kuwait Oil Company's Ahmadi loading facilities near the town of Shaiba, was scheduled to go on stream during the third quarter of 1958. Initial capacity was put at about 30,000 barrels per day.

During 1957, Aminoil's profits were sufficient to erase deficits created by previous operations. Wafra field was discovered in 1953.

## Qatar . . . Dukhan oil field sets new crude production record of 140,701 barrels daily

CRUDE OIL production in 1957 rose to a record level of 140,701 barrels daily, totaling 51,356,000 barrels for the year. All production was from Qatar Petroleum Company Ltd.'s lone field, Dukhan, located along the west side of the peninsula. Qatar thus recorded a 13.8 percent increase above the 123,594-barrels-a-day crude production figure averaged during 1956.

Since Qatar is the nearest Persian Gulf producer country to the Gulf's outlet, it suffered less severely from the tanker shortage that resulted from the late 1956 Suez crisis than several other Persion Gulf-area producer nations. It was likely, in fact, that the crisis was over at the start of 1957 insofar as Qatar's production was concerned.

Otherwise, Qatar's 1957 oil industry remained essentially unchanged. Two drilling rigs were in use in November in Dukhan field, with one remaining active at the year's end. Five wells were completed during 1957, all oil producers in Dukhan field. A total of 36,518 feet of hole was drilled, representing an 8.4 percent decrease from the previous year, when 39,868 feet was drilled. Thus, 1957 was the second consecutive year during which drilling footage decreased from the previous one. Total cumulative footage drilled in onshore

See Insert Map

Qatar as of Dec. 31, 1957, was 424,762 feet.

In Dukhan field, 48 wells were on production at the end of 1957.

Total production during the first three months of 1958 in Qatar amounted to 1,935,821 long tons, which, extrapolated in accordance with Qatar Petroleum Company Ltd.'s 1957 conversion factor of 7.884 barrels per ton, would provide a figure of 15,184,580 barrels, or an average of 168,718 barrels per day during the first quarter of 1958.

Four party months of seismic reflection work were conducted by Qatar Petroleum Company Ltd. last year.

Dukhan field's output is pipelined across the Qatar peninsula via 14½ and 20-inch pipe lines to the eastern shore for tanker loading at Umm Said, 60 miles distant. A topping plant at Umm Said to provide products for local needs continues to operate at 600 barrels per stream day atmospheric distillatian capacity.

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continuing with plans to resume drilling its concession offshore from the mainland. In June, 1957, Bataafsche Petroleum placed an order with N. V. Werf Gusto of Schiedam, Holland, for a new mobile drilling platform for offshore Qatar use, to replace the one wrecked in December, 1956, while being moved to a new location. The new rig is expected to be drilling in the Persian Gulf by the middle of 1959, at a location 50 miles northeast of Ras Laffan. The rig is rated at 15,000 feet, with the platform capable of 100-foot depths.

# Saudi Arabia . . . Aramco discovers new major oil supplies; production rises

• MAJOR NEW field discoveries at Khurais 150 miles inland and at Manifa in the Persian Gulf.

• A likely 12-mile northward extension of Ghawar field at 'Ain Dar 56.

• Establishing of production from Permian beds at Damman.

These exploration highlights recorded in Saudi Arabia during 1957 and early 1958 by Arabian American Oil Company as it continued to uncover major new deposits of oil following the Khursaniyah discovery in 1956. Expansion of Trans-Arabian Pipe Line Company's 30-31-inch crude oil line to the Mediterranean Sea was being completed in mid-1958, and plans were being made to increase the capacity of the Ras Tanura marine terminal.

**New discoveries.** In late March, 1957, Aramco announced that 'Ain Dar 56, a wildcat located 12 miles north-northwest of the northernmost well in the 140-mile long Ghawar field, had found 38-gravity oil. The well was drilled to a total depth of 7,325 feet and was completed in the Arab D member at 7,120 feet.

As of early 1958, there was some doubt whether 'Ain Dar 56 had extended Ghawar or had found a new field.

**Gas at Dammam.** Aramco completed Dammam 43 during 1957, after considerable difficulty in getting a liner cemented prior to completion. Drilled to 10,224 feet, the well was completed in the Khuff limestone of Permian age from 8,492 to 8,596 feet, and produces enough gas to fulfill local requirements. This is the first production from the Permian in Saudi Arabia, though gas has been found in Permian beds in deep tests on Bahrain Island.

See Insert Map

**Khurais test.** On Aug. 2, 1957, Aramco spudded a rank wildcat in the Dahna sand belt 90 miles east of Riyadh, 75 miles west of the Ghawar field and about 20 miles east of the boundary between its concession and the "preferential rights" zone. Known as Khurais 1, the test was projected to 10,000 feet. The Khuff limestone was the ultimate target. Encouraged by the gas in the Khuff at Dammam, approximately 130 miles downdip from Khurais, it was hoped that the


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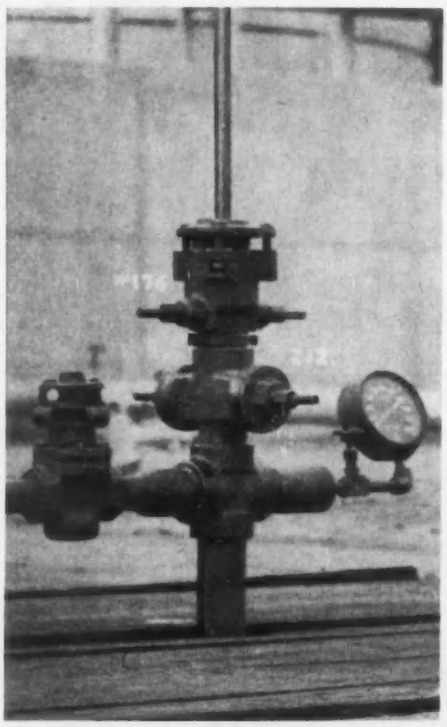

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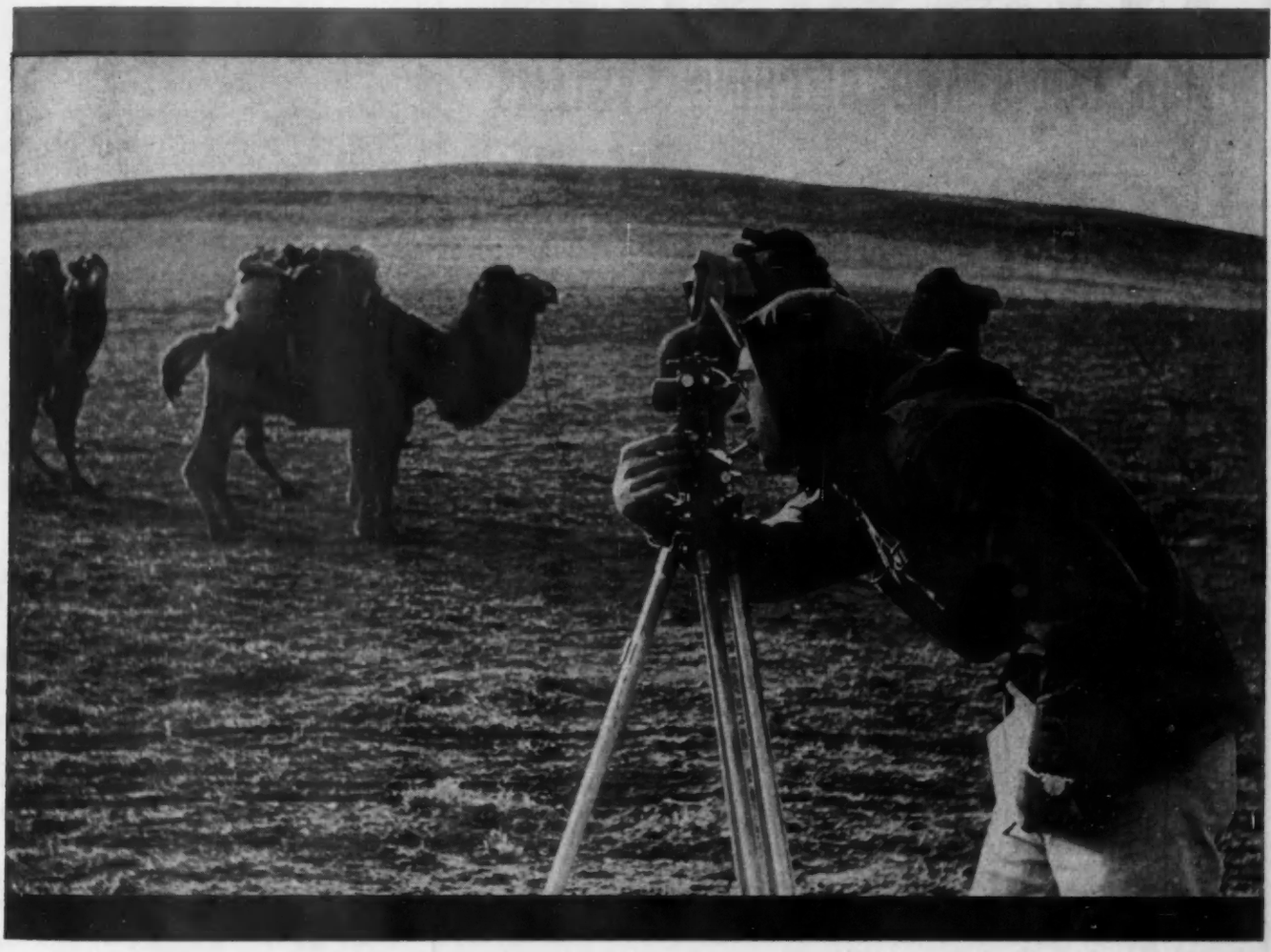

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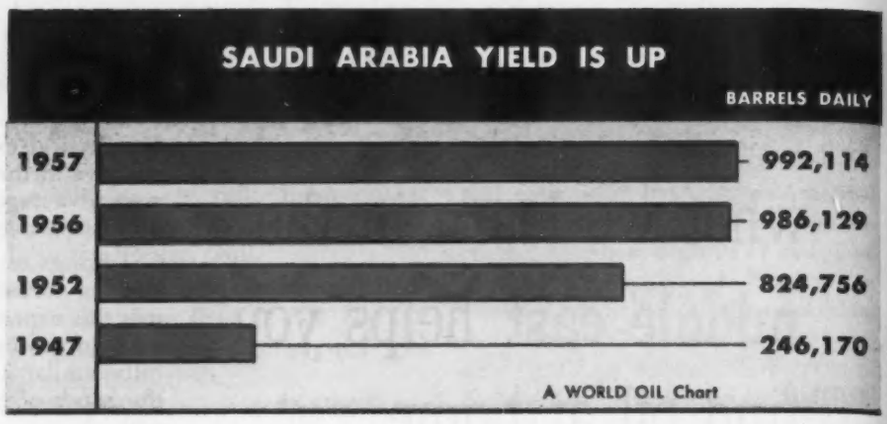
Khuff, or shallower formations, would be oil bearing.

The Arab zone of the Jurassic proved better developed than anticipated, and oil flowed on two drill stem tests taken in the interval 4,755 feet to 4,898 feet.

Below the Arab Zone, a tight limestone, heavily saturated with 31-gravity oil, was reported above 5,300 feet. This zone tested at a rate of 250 barrels daily.

The discovery was drilled to 10,621 feet in Sudair shale (above the Khuff), and plugged back to 4,975 feet for completion in the Arab D member. The oil is sour, with gravity varying from 33 to 37. Tests indicated flowing rates of from 3,000 to 4,000 barrels per day.




Khurais 2, located four miles southwest of Well 1, was spudded Feb. 27, 1958 and drilled to a total depth of 7,338 feet. It was plugged back to 5,654 feet and completed in May as an oil producer in the Arab D member. A third test was being drilled 5½ miles southeast of Khurais 1.

**New trend.** The discovery, being about 75 miles updip from Ghawar, is not only a major reserve in itself but also apparently opened up an entirely new trend, far west of any other prospective area proven productive heretofore. In addition, the Khurais discovery enhances the large area lying east of the 46th meridian and west of an arc pointing eastward that describes the west margin of Aramco's concession.

**Manifa.** Following on the heels of the Khurais success, Aramco discovered its second offshore field in the Persian Gulf at Manifa, located 20 miles southeast of Safaniya field and eight miles offshore. The barge Queen Mary was used to drill the well.

The test was spudded on Sept. 30, 1957. Both sands in the Bahrain zone and the Zubair sand (Cretaceous), productive at Safaniya, were unproductive at Manifa 1. However, oil was found in the Sulaiy formation from 7,615 to 7,800 feet and 7,810 to 7,865 feet. Completion of a major flowing oil well was made in these intervals. The crude is 30 gravity and is sour. This is the first well to be completed in the Sulaiy limestone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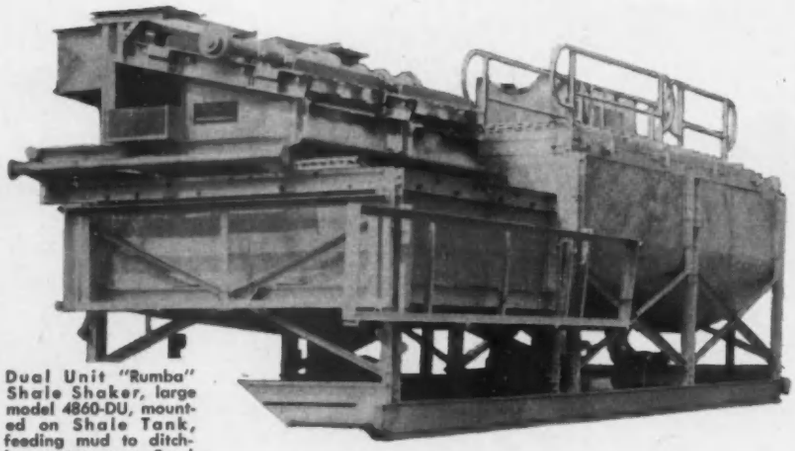

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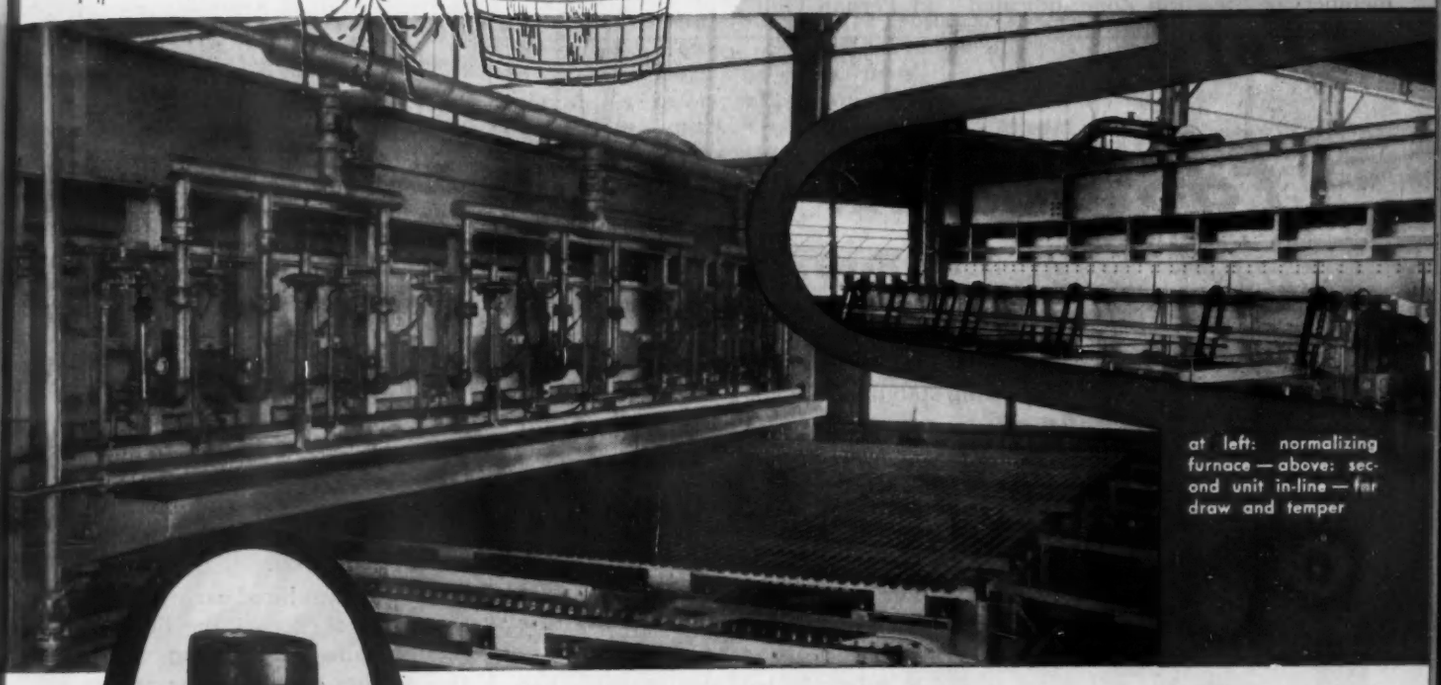
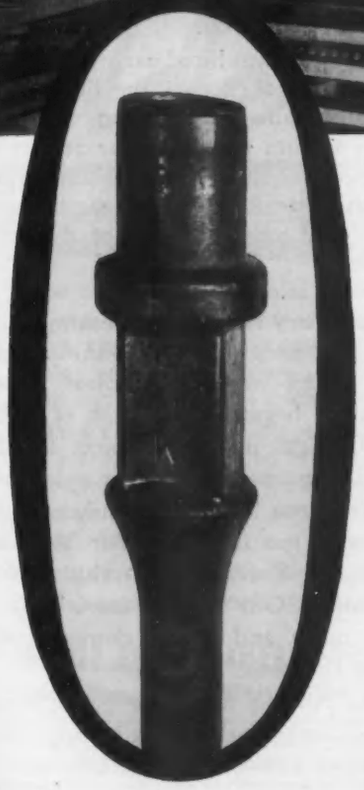


at left: normalizing furnace — above: second unit in-line — for draw and temper



Unretouched photograph of rod end before heat-treat. Note clean smooth forging by electric-induction process, unique with Norris.

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## Crude Run from Field Storage in Saudi Arabia, 1957

| Crude Oil To Tapline Facilities At Qaisumah, In Barrels | Barrels Per Day | Percent of Total Crude Runs From Field Storage, 1957 | Crude Oil To Ras Tanura Refinery Tankage, In Barrels | Barrels Per Day | Percent of Total Crude Runs From Field Storage, 1957 | Crude Oil To Bahrain Via Pipe Line, In Barrels* | Barrels Per Day | Percent of Total Crude Runs From Field Storage, 1957 | Crude Oil Run To Tankers At Ras Tanura | Barrels Per Day | Percent of Total Crude Runs From Field Storage, 1957 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 127,645,293 | 349,713 | 35.4 | 70,308,156 | 192,625 | 19.5 | 44,717,922 | 122,515 | 12.4 | 117,631,608 | 322,278 | 32.7 |

Total crude oil run from field storage in 1957, barrels..... 360,302,979
Total crude oil run from field storage in 1957, bbls daily..... 987,131
Total percent..... 100.0

* Bahrain pipe line closed from November 7, 1956, until March 9, 1957.

horizon in Saudi Arabia. Its age is lower Cretaceous.

Drillstem tests in the productive members of the Arab Zone indicated flows of at least 2,500 barrels per day. (See WORLD OIL, March 1958, "Manifa is Second Offshore Discovery in Persian Gulf".

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**Other exploration.** Four seismograph, one combination gravity-magnetometer and three structure drill parties continued Aramco's search for new drilling prospects in remote parts of the concession area. Emphasis was placed on the Rub' al Khali, where a seismic team worked the extreme southwestern part early last year and then moved about 300 miles northeastward.

**Production.** Crude production in Saudi Arabia amounted to 362,121,478 barrels during 1957 for a daily average of 992,114 barrels, an increase of 5,985 barrels per day. This was due to the Suez crisis and the international political situation at the time, King Saud having banned oil shipments to Britain and France and the loading of British and French tankers with Saudi Arabian oil.

The ban was lifted early last spring. As a consequence of the Suez crisis, Saudi Arabian production was running behind the 1956 rate as late as May, 1957, but made a strong rally in the latter half of the year to bring the 1957 total in excess of the 1956 figure.

**Secondary recovery.** Pressure maintenance programs for Ghawar field got under way in October, when Aramco began construction of a $29 million gas injection project for the 'Ain Dar area. The project is designed to compress 200 MMcf daily of high-pressure gas from the four 'Ain Dar and one Shedgum gas-oil separator plants (GOSP's) and inject it into the north and south domes of the 'Ain Dar area.

At Abqaiq field, the gas-injection plant, in operation since March, 1954, injected high-pressure gas into the top of the structure at the rate of 150,236,000 cubic feet per average day in 1957. In 1958, a third injection well was to be placed in service to allow injection of 210 MMcf of gas daily.

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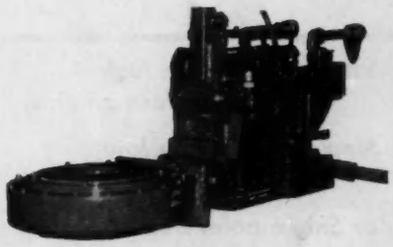

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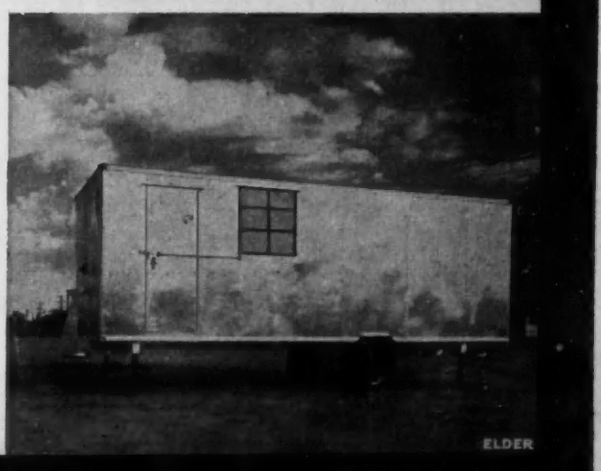

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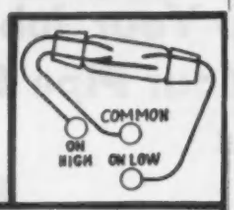


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| 0-20# | 30 | 1 |
| 0-35 | 50 | 1¾ |
| 0-60 | 125 | 3 |
| 0-60 | 150 | 6 |
| 0-100 | 125 | 3¾ |
| 0-100 | 200 | 6 |
| 0-100 | 300 | 6 |
| 0-150 | 200 | 7 |
| 0-150 | 240 | 8 |
| 0-150 | 300 | 8 |
| 0-200 | 240 | 8 |
| 0-200 | 300 | 8 |
| 0-300 | 400 | 12 |
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**WRITE FOR CATALOG NO. 858**

**THE MERCOID CORPORATION**

**CHICAGO 41, ILL.**


On Dec. 3, 1957, Aramco produced its three billionth barrel of crude oil. Saudi Arabia is the sixth nation to achieve this cumulative production, after the U. S., Venezuela, Russia, Mexico and Iran. Crude oil production during the first five months of 1958 was 150,888,475 barrels, an average of 999,261 barrels daily, or 18.9 percent ahead of production rates in the first five months of 1957.

**Drilling.** Aramco completed 17 wells during 1957, including 11 oil wells, four water injection wells, one gas well, and one dry hole (at Khursaniyah). The Khurais and Manifa wells were all listed as 1958 completions. Aramco drilled 131,470 feet of hole last year. At the end of the year, four rigs were active, one each at Manifa, Khurais, 'Ain Dar 57, and on water-injection wells at Abqaiq. One workover rig was kept busy in Ghawar most of the year and was on similar duty at Abqaiq as 1957 ended.

Nine of the oil completions were made at Safaniya, before the Queen Mary was moved to Manifa at the end of August. As offshore activity heightened, a new mobile platform, Aramco's first, was being built. It was expected to be used in the development of the newly-discovered Manifa field. The platform arrived at Ras Tanura on May 10, 1958, after being towed by tug from Vicksburg 10,000 miles to the Persian Gulf via the Suez Canal. It can drill in water up to 65 feet deep.

**Pipe lines.** Aramco's peak capacity for crude oil delivery was about 1.4 million barrels daily at the end of 1957. The $17.2 million, 22-inch, 137-mile crude pipe line from Safaniya to Ras Tanura was completed at the end of March, 1957, with an initial capacity of 50,000 barrels a day. After installation in August of three 1,000-hp gas turbines which operate on natural gas from the Safaniya GOSP, capacity rose to 115,000 barrels daily.

A booster station at the midpoint of the line near Khursaniyah field was scheduled for 1958 completion, to boost capacity to 175,000 barrels daily.

Aramco placed two 5,000-hp combustion-gas turbines in operation during 1957, the first at Wari'ah on January 28 and the other at Tufaih on October 5 as part of a concerted Aramco-Tapline project to boost Tapline's throughput to 460,000 barrels daily by the middle of 1958. The initial goal of 410,000 barrels daily capacity by the end of 1957 was exceeded by about 25,000 barrels. Tapline had virtually completed its part of the expansion program by April, 1958, and Aramco expected to install additional facilities at Nariyah.

During 1957, Tapline delivered 125,331,297 barrels of crude oil from Sidon, Lebanon, for an average of 343,373 barrels daily. This rate was 12,628 barrels per day more than the 1956 average, for an increase of 3.8 percent in 1957. During the first five months of 1958, Tapline delivered

**Crude Oil Production in Saudi Arabia**

| FIELD | Crude Oil Production 1957, bbls. | 1957 Production, bbls Daily | STATUS OF WELLS AT END OF 1957 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Number Wells Producing | Shut in or Standing | Observation | Injection | Suspended | Abandoned | Drilling |
| Ghawar: | | | | | | | | | |
| 'Ain Dar | * | * | 44 | 5 | 2 | 0 | 0 | 1 | 1 |
| Shedgum | * | * | 14 | 1 | 1 | 0 | 0 | 1 | 0 |
| 'Uthmaniyah | * | * | 30 | 13 | 3 | 0 | 1 | 2 | 0 |
| Hawiyah | * | * | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Haradh | * | * | 0 | 7 | 1 | 0 | 1 | 0 | 0 |
| Total Ghawar | 214,017,253 | 586,349 | 88 | 27 | 8 | 0 | 2 | 4 | 1 |
| Abqaiq | 103,998,720 | 284,928 | 50 | 14 | 2 | 10† | 0 | 1 | 1 |
| Safaniya | 20,489,640 | 56,136 | 16 | 11 | 1 | 0 | 0 | 0 | 0 |
| Dammam | 14,493,785 | 39,709 | 28** | 3*** | 1 | 0 | 0 | 10**** | 0 |
| Qatif | 9,122,080 | 24,992 | 10 | 0 | 1 | 0 | 1 | 1 | 0 |
| Abu Hadriyah | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 |
| Fadhili | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Khurais | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Khursaniyah | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 0 |
| Manifa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Four other areas†† | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| Totals | 362,121,478 | 992,114 | 192 | 59 | 15 | 10 | 4 | 22 | 4 |

* Production by individual Ghawar Field areas not tabulated.
** Including three gas wells. *** Including one gas well. **** Including two gas wells.
† Including two gas-injection and eight water-injection wells.
†† Dry holes at al-'Alah, al-Jauf, Ma'qala, and Stratigraphic well.

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53,155,833 barrels, an average of 352,025 barrels daily. This represents a 4 percent increase above the rate delivered during the same period in 1957.

At the Ras Tanura marine terminal, an 800-foot extension to the 1,360-foot north pier was to be completed in 1959.

**Refining.** Following the trend of the past several years, crude runs at the Ras Tanura refinery averaged 192,623 barrels daily in 1957, representing about a 3 percent decline from the 1956 rate.

# Turkey . . . Wildcat drilling pace quickens as crude production level is maintained

EXPLORATORY activity was accelerated during 1957 and 1958 in Turkey and it appeared only a matter of time before significant new reserves of crude oil and natural gas were found. Six wildcat tests were completed in 1957, and five more were being drilled at the end of the year. Another wildcat, N V Turkse Shell's Terzili 1 was spudded in Turkish Thrace on Feb. 18, 1958.

Almost 40,000 feet of hole was drilled in exploratory wells last year. Sixteen different companies held 214 licenses scattered through eight districts from Thrace to the Iraq frontier, by April, 1958.

**Production.** Crude oil production from Raman and Garzan fields in the Siirt District (V) in southesastern Turkey maintained about the same rate recorded in 1956. Production in 1957 amounted to 2,050,680 barrels (5,618 barrels daily), less than a 1 percent drop from the 5,666 barrels daily rate in 1956. In 1957, 1,338,275 barrels, or 65.3 percent of the yield, came from Raman field, and 712,405 barrels, or 34.7 percent, was produced from Garzan.

Most of the field wells drilled in 1957 were concentrated on the Garzan structure. Including development

See Insert Map

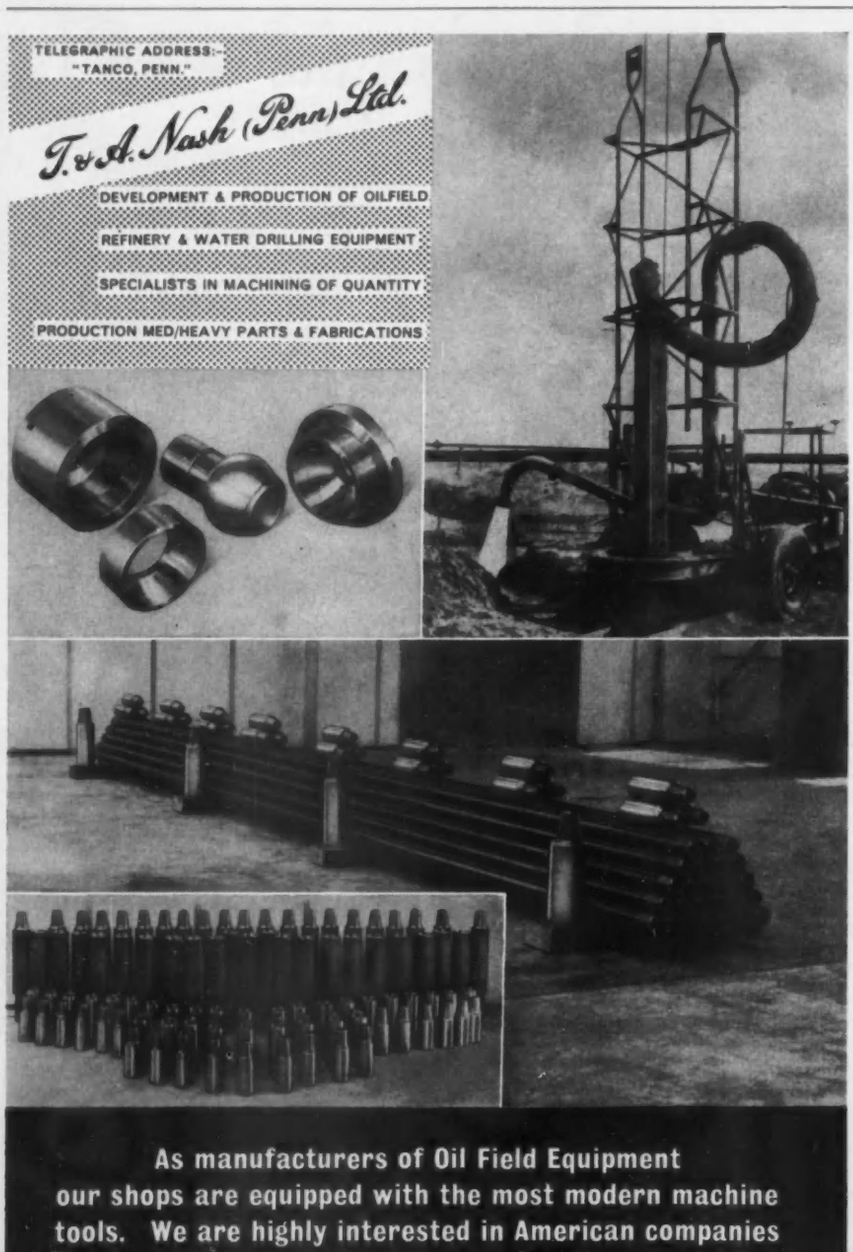
drilling, an estimated 87,000 feet of hole was drilled during 1957 in Turkey.

**Exploration.** American Overseas Petroleum Ltd. drilled two interesting tests:

1. Aril 1, 12 miles east of Gaziantep on the Beyzaz structure in District VI, was spudded in 1956 and was abandoned on July 3, 1957 after finding bituminous marly limestone in the Cretaceous at about 2,000 feet.

2. Kahti 1, located on a large surface anticline 17 miles southeast of Adiyaman in District VI, was spudded on Nov. 17, 1957. The well was drilled to 6,365 feet in April, 1958, in high-angle Paleozoic beds. Heavy oil shows in bleeding cores of Cretaceous limestone led to pipe being set and perforated from 3,650 to 4,250 feet for acidizing and testing. The show was later reported as non-commercial.

Amoseas conducted 19.5 party months of surface geological work, with one crew in the Salt Lake area (District II) of the Anatolian Plateau, and the other in Thrace. A contract seismic party also worked for Amoseas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**1950** — **Developed SIMULTANEOUS RADIATION LOGGING**
. . . utilizing a pure neutron/neutron to avoid faulty phenomena of detrimental gamma rays.

**1951** — **Developed FOUR-RESISTIVITY-CURVE ELECTRICAL LOG**
. . . employing an S. P. curve of greater detail for more accurate analysis of formations.

**1952** — **Developed JUMBO SIDEWALL CORE SAMPLING**
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**1953** — **Developed QUANTITATIVE EVALUATION OF POROSITY**
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**1954** — **Developed "MIGHTY MOUSE"® CHAMP OF THE MIDGET GUNS**
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**1955** — **Developed SIMULTANEOUS 4-RESISTIVITY CURVE ELECTRICAL LOG**
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**1956** — **Developed NEW HIGH-PRECISION MICRO-CALIPER SURVEY**
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in Thrace. Amoseas is operator for California Asiatic Oil Company and Texaco Overseas Petroleum Company. The two firms have taken over Amoseas' former licenses on a 50-50 ownership basis.

Esso Standard (Turkey) Inc. drilled two dry holes in 1957 and completed a third in 1958 in Thrace. Two Esso test in southeastern Turkey were scheduled.

Mobil Exploration Mediterranean, a Socony Mobil Company, expected to bring a rig into Turkey in 1958. In 1957 Mobil conducted 22 party months of geological work and 35 crew months of geophysical work. Robert H. Ray was contractor for one gravity crew and one seismograph party. Geophysical Associates International had a contract crew in Turkey working for Mobil, with a second GAI crew due to start seismic work for the same client in 1958.

Bolsa Chica Oil Corporation was reported to have spudded Zengilan 1 in District V, located northwest of Garzan and Raman fields, in May, 1958.

Tidewater Oil Company spudded Bakuk 1, its first test in Turkey, on Dec. 3, 1957. The test is close to the Syrian border in District V, near Nusaybin, Turkey, and about 30 miles northwest of the Karatchok field in Syria. Tidewater is joined by The Atlantic Refining Company and Seaboard Oil Company in its Turkish ventures. By April, 1958, the test was below 5,000 feet in Mesozoic beds. Two gas shows were reported in Cretaceous strata.

Turkish-American Oil Company, Cizre, affiliated with Gilliland Oil Corporation, S. A., spudded Rubai 1 near Cizre in District V opposite the Syrian and Iraq frontiers on Aug. 30, 1957. The well was suspended at 7,462 feet in Miocene in April, 1958. Another Gilliland well, drilled by Turkish-American Oil Company, Iskenderun, was begun late in 1956 to test a submerged structure in the Gulf of Iskenderun by directional drilling. It was suspended in March, 1957, at 5,943 feet in Miocene shales after three holes had been drilled in different directions.

In January, 1958, announcement was made that D. D. Feldman Oil and Gas Inc. and Turkish Gulf Oil Company, a new Gulf Oil Corporation subsidiary, had concluded an agreement by which Feldman assigned to Gulf 75 percent interest in 13 oil licenses covering about 1.5 million acres in Turkey. Feldman continued with geological mapping of these licenses.

Turkiye Petrolleri Anonim Ortakligi, 51 percent controlled by the government, made significant extensions to the Garzan field, increasing proven reserves. The company also drilled a dry hole at Resan 5 which found oil shows in Cretaceous limestone, and was testing oil shows at Germik 1, also in District V, at 6,430 feet.

**Law amendment.** During 1957, the Turkish Petroleum Law 6326, as amended by Law 6558 in 1955, was amended a second time by Law 6987. Purpose of the new legislation was to clarify and amplify previous codes, particularly regarding foreign crudes transported through pipe lines and refined in Turkey. Under the new amendment, the Council of Ministers is authorized to determine whether the Petroleum Law would apply to any future international pipe lines passing through Turkey, or whether other existing laws would govern the situation.

*See tables on Page 256*


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ANVIL

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PIPE AND COUPLING COMPANY
ALLISON PARK PA., U.S.A.


## Exploration Licenses in Turkey

| Name of Company | DISTRICTS I | II | III | IV | V | VI | VII | VIII | Total, 1956 | Total of 1957—April 1958 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Amoseas | 7 | 7** | .. | .. | .. | 8+3** | .. | .. | 15 | 25 |
| 2. Bolsa Chica | .. | .. | .. | .. | 3 | .. | 2 | .. | 5 | 5 |
| 3. Deilmann | 4 | .. | .. | .. | .. | .. | .. | .. | 4 | 4 |
| 4. Feldman | .. | 3+4** | .. | .. | 1** | 3 | 1+2** | 2+2** | 9 | 18 |
| 5. Deutsche Erdoel* | .. | .. | .. | .. | 8 | .. | .. | .. | 0 | 8 |
| 6. Esso Standard | 4 | 8 | .. | .. | 6+2** | 7 | 2+3** | .. | 27 | 32 |
| 7. ETTA Ltd.* | .. | .. | .. | .. | .. | .. | .. | 1** | 0 | 1 |
| 8. Ist. Tabii Gas | 4 | 4** | .. | .. | .. | .. | 1+2** | .. | 5 | 11 |
| 9. Marmara Pet. (Husky) | 4 | .. | .. | .. | .. | .. | .. | .. | 4 | 4 |
| 10. Mobil Explor. Mediterranean | .. | 8** | .. | .. | 8 | 8 | 8 | .. | 24 | 32 |
| 11. N V Turkse Shell | 5 | .. | .. | .. | 8 | 8 | .. | .. | 21 | 21 |
| 12. Tidewater | 3 | .. | 5 | .. | 8 | 6 | 4 | .. | 26 | 26 |
| 13. T.P.A.O. | 3 | 1 | 1 | 1 | 7+1** | 6+2** | 1 | .. | 20 | 22 |
| 14. T-A Oil Cizre* (Gilliland) | .. | .. | .. | .. | 1** | .. | .. | .. | 0 | 1 |
| 15. T-A Oil Isk.* (Gilliland) | .. | .. | .. | .. | .. | .. | 1** | .. | 0 | 1 |
| 16. Gilliland Oil Company | .. | .. | .. | .. | 1 | .. | 1 | .. | 2 | 2 |
| Total: (1956) | 34 | 12 | 6 | 1 | 41 | 46 | 20 | 2 | 162 | .. |
| 1957-April 1958 | 34 | 35 | 6 | 1 | 54 | 51 | 28 | 5 | .. | 214 |

* New companies or subsidiaries.
** New licenses granted during 1957 and up to end of 1958.
Names of companies are written out in full as follows: 1. American Overseas Petroleum Ltd. 2. Bolsa Chica Oil Corporation. 3. Deilman, Montan GmbH. 4. D. D. Feldman Oil and Gas Inc. and Turkish Gulf Oil Company. 5. Deutsche Erdoel Aktiengesellschaft. 6. Esso Standard (Turkey) Inc. 7. ETTA Limited Sirketi. 8. Marmara Petroleum Corporation (subsidiary) of Husky Oil Company. 9. Istanbul Tabii Gas (Istanbul Natural Gas). 10. Mobil Exploration Mediterranean. 11. N. V. Turkse Shell (N.V. Bataafsche Petroleum Maatschappij). 12. Tidewater Oil Company. 13. Gilliland Oil Corporation S.A. 14. Turkish-American Oil Company, Iskenderun. 15. Turkish American Oil Company, Cizre. 16. Turkiye Petrolleri Anonim Ortakligi (Turkish Petroleum Company).

## Exploratory Tests Drilled in Turkey During 1957 and 1958

| Name of Company | Well | District | Spud Date | Drilling Depth 12-31-57 | Abandonment Date | Total Depth and Remarks |
|---|---|---|---|---|---|---|
| Esso Standard (Turkey) Inc. | Ceylan 1 | I (Thrace) | 4- 5-57 | ..... | 6- 4-57 | 4,364 feet in pre-Tertiary metamorphics. |
| Esso Standard (Turkey) Inc. | Osmancik 1 | I (Thrace) | 6-22-57 | ..... | 10-12-57 | 8,590 feet. Oil shows. |
| | Karapurcek 1 | I (Thrace) | 11- 6-57 | ..... | 4-24-58 | 10,839 in Eocene. |
| N. V. Turkse Shell | Terzili 1 | I (Thrace) | 2-18-58 | ..... | ..... | Drilling at 6000 feet, late April 1958. |
| Turkish Petroleum Corporation | Resan 5 | V | 4-23-57 | ..... | 7-27-57 | 5,510 feet. Oil shows in Cretaceous lime. |
| Turkish Petroleum Corporation | Kentalan 6 | V | 10- 4-56 | ..... | 1957 | 1,370 feet, technical trouble. |
| Turkish Petroleum Corporation | Germik 1 | V | 8- 6-56 | ..... | ..... | 6,430 feet, testing Miocene oil shows. |
| Turkish-American Oil Company Iskenderun (Gilliland) | Iskenderun 1 | VII | 10- 3-56 | ..... | 3-13-57 | 5,943 feet; 3 directional holes below marine water. |
| Turkish-American Oil Co., Cizre (Gilliland) | Rubai 1 | V | 8-30-57 | ..... | ..... | Suspended in April, 1957, at 7,462 feet in Miocene. |
| Tidewater Oil Company | Bakuk 1 | V | 12- 3-57 | 472 feet in Eocene | ..... | 5,000 feet drilling in (?) Jurassic, April '58. Gas shows in Cretaceous. |
| American Overseas Petroleum Ltd. | Arel 1 | VI | 11-18-56 | ..... | 7- 3-57 | 10,153 in Silurian. Bitumens in Cretaceous lime. |
| American Overseas Petroleum Ltd. | Kahta 1 | VI | 11-17-57 | ..... | ..... | 6,365 feet, in Paleozoic. Pipe perforated, 3,650 — 4,230 to acidize and test heavy oil shows in Cretaceous. |

# Other Middle East . . . A roundup

See Insert Map

CONTINUING VIGOROUS exploration operations were reported throughout other Middle Eastern areas during 1957 and the first six months of 1958. These activities were highlighted by the confirmation of oil at Marmul in Dhofar and by extensions to Syria's Karatchok oil field.

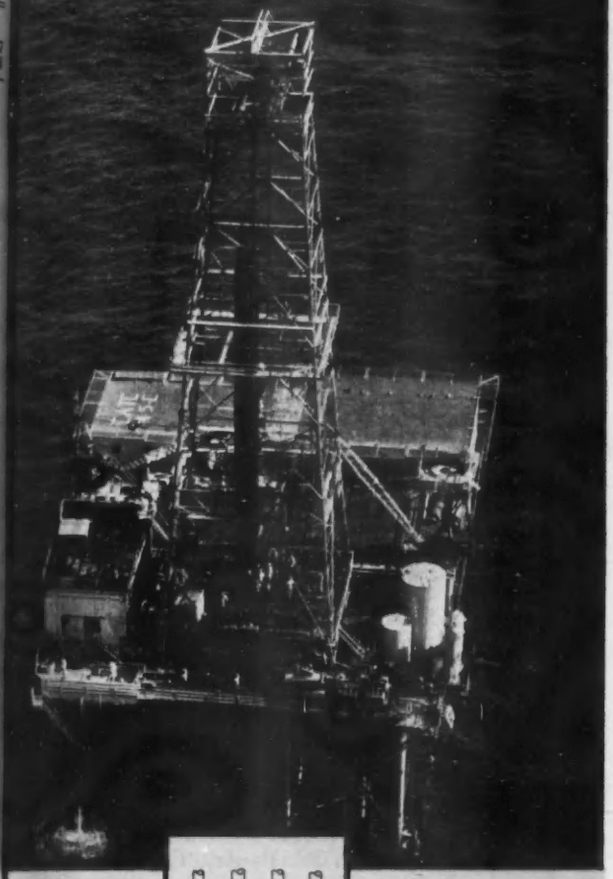
### Dhofar

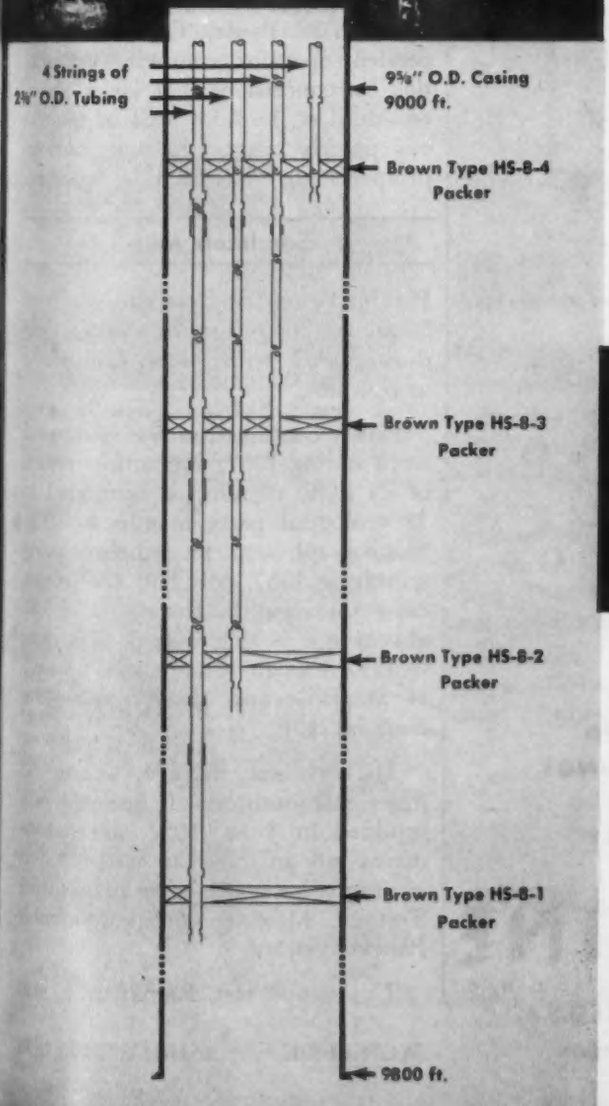
EXPLORATION CONTINUED at a vigorous pace in Dhofar during 1957 and 1958, spurred by the discovery of oil at Marmul. Dhofar-Cities Service Petroleum Corporation, operator of the 32,000-square-mile concession in which Richfield Oil Corporation has a 50 percent interest, confirmed Dhofar's first oil field upon completion of Marmul 2 for 2,000 barrels daily of 21 gravity asphalt-base oil from 3,200 feet in July, 1957.

Further development at Marmul has proved somewhat disappointing. Marmul 3, a west stepout from Marmul 1, found salt water in the pay sand and, after being deepened to 9,844 feet, was abandoned as a dry hole. Further tests of Marmul 2 in-

# FIRST QUADRUPLE STRING COMPLETION

## *Utilizes Brown Hydraulic Set Retrievable Packers*




4 Strings of 2⅜" O.D. Tubing
9⅝" O.D. Casing 9000 ft.
Brown Type HS-8-4 Packer
Brown Type HS-8-3 Packer
Brown Type HS-8-2 Packer
Brown Type HS-8-1 Packer
9800 ft.

Oil Industry history was made in June of this year when the first quadruple string completion was made in an oil well by the CATC Offshore Group (Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.). The well, the West Delta Block 30 Field, State 970, No. C-8, is located in offshore Plaquemines Parish and is the first well in history to produce four different zones through four individual tubing strings.

Four Brown Hydraulic Set Retrievable Packers were used in the well completion operation and installed by Brown Service Engineers. All four packers were run on the number one string and set in the interval of 9,000 to 9,800 ft. Each packer was set individually and tested from both directions prior to setting the next packer.

Years of research and testing went into the development and manufacture of the HS-8 Series packers. Single and dual Hydraulic Set Packers were successfully used over two years ago. A short time later, after continuous research, the triple string packer was perfected and accepted by the industry. Now, the development of the first quadruple string packer marks another engineering milestone in Brown's long history of firsts.

Brown equipment was used in the first detachable dual string completion, the first detachable triple string completion, and *now,* the first quadruple string completion.

Let "P·R·I·M·E Completions by Brown" save you money. For complete brochure on Hydraulic Set Packers write Brown Oil Tools, Inc., P. O. Box 19236, Houston 24, Texas.

Packers used in CATC quadruple string completion

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8490 Katy Road, Houston, Texas.

dicated a rapid decline in productivity. Completion is in about 80 feet of net (pre-Cretaceous) sandstone pay.

It appeared that only the top of the Marmul structures, which is about 10 miles long and 5 miles wide, may contain oil. Nevertheless, the presence of oil was encouraging, since many other structures remain to be tested in Dhofar.

Marmul field is located about 35 miles inland from the Arabian Sea coast and about 550 miles southeast of the south end of Ghawar field in Saudi Arabia, the nearest production. Marmul is also about 800 miles east and slightly north of the Aden refinery.

Traces of light oil were also found at Mazraq, a prospect located 30 miles north of Marmul. Two deep dry holes had been completed at Mazraq by the end of 1957. Two rigs, one heavy, the other light, continued in service in Dhofar.

**See Insert Map**

Marmul 1 had been drilled to 8,597 in August, 1956, and abandoned. The big rig then was moved to Mazraq 1, which was temporarily abandoned in June, 1957 at 9,820 feet. The smaller rig was brought in and put into service to evaluate the Marmul area more thoroughly. Marmul 2, located about 1½ miles southeast of Marmul 1, was drilled to 4,766 feet and plugged back to about 3,200 feet for completion as an oil well.

Marmul 1 later was re-entered and found to be productive in the same zone. Marmul 3, located 1½ miles west of 1, was abandoned on March 3, 1958. Another wildcat, Northwest Marmul 1, was abandoned on Jan. 10, 1958, at 11,191 feet.

During 1957, five wells and about 36,800 feet of hole were drilled last year.

## Jordan

JORDAN TOOK rapid strides during 1957 and early 1958 toward development of a bona fide domestic oil industry. A dry hole was completed, and a second exploratory test was being readied at the end of December. New concessions were formally granted, and the nation's first refinery was proposed. Economic integration with Iraq, with which Jordan federated early in 1958, began as petroleum products commenced to be supplied to Jordan from the Daura refinery in Baghdad.

Edwin W. Pauley, California independent operator, continued exploration on concessions that cover about one-third of Jordan's area in numerous parcels scattered over various prospects throughout the country.

**See Insert Map**

Phillips Petroleum Company acquired 50 percent interest in these concessions during 1957, with Pauley continuing as operator.

Pauley continued surface geological work during 1957, amounting a total of 24 party months, as compared to 12 geological party months in 1956. Seismograph work totaled three party months in 1957, only half the seismic crew time put in during 1956. No gravity nor magnetic work was done in 1957, though 12 crew months each of magnetic and gravity work was done in 1956.

The first test, Safra 1, located 27 miles east-southeast of Amman, was spudded in June, 1957, and abandoned late in the year at 8,471 feet in granite basement, after penetrating Tertiary, Mesozoic and questionable Paleozoic strata.

The second test, Ramallah 1, was


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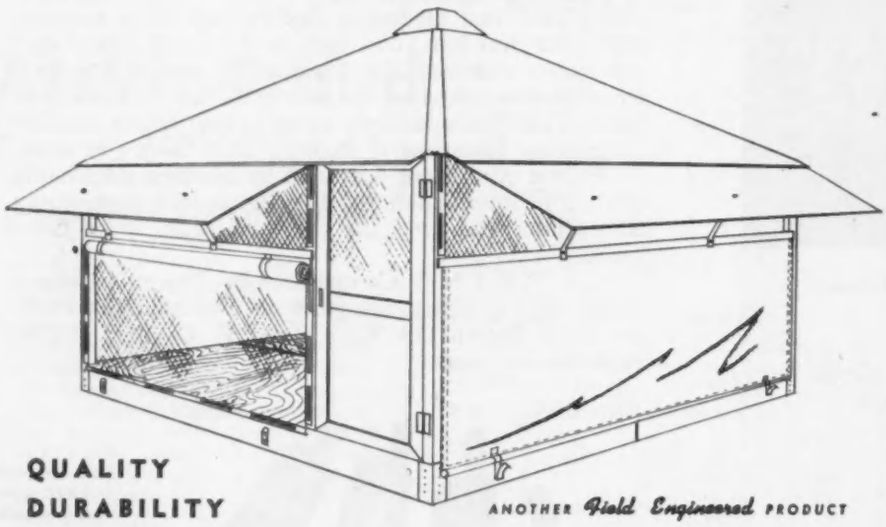

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**TROPICAL CAMP**

| MODEL NO. | ERECTED SIZE |
|---|---|
| A- 8-4 | 8′ x 8′ |
| A-16-4 | 8′ x 16′ |
| A-10-4 | 10′ x 10′ |
| A-20-4 | 10′ x 20′ |

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Driscose high-purity CMC is your best, most economical insurance for trouble-free holes. Let us demonstrate the advantages of drilling with Driscose low-solids systems at one of your rigs.

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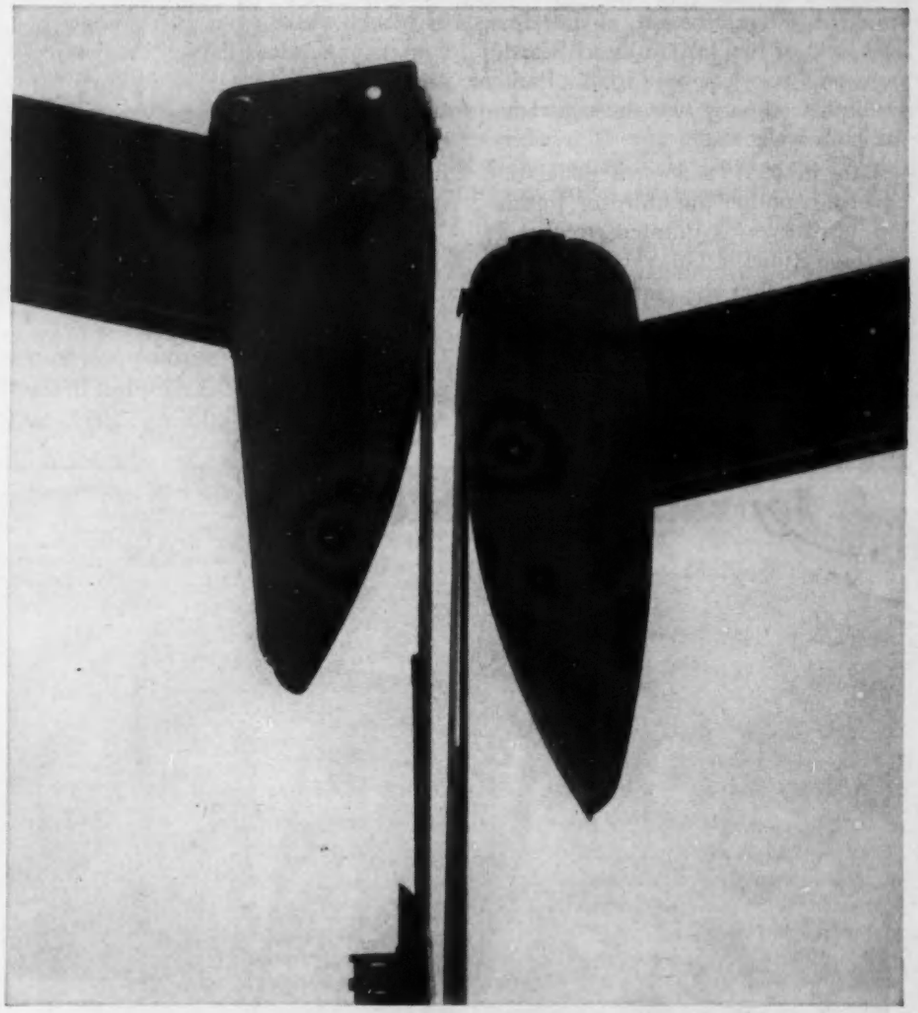

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By drilling with Driscose low-solids muds and cementing with Diacel cement systems, you can hold rig time and drilling and completion costs to a minimum.

Drilling fluids treated with small amounts of Driscose high-purity CMC combine a strong filter cake and low water loss with high stability and low weighting material requirements to give you an economical and reliable mud program.

Diacel D low-density cement systems give you cement densities very close to those of drilling muds. Diacel LWL protects you from flash setting. High bottom-hole temperatures and pressures are no problem when Diacel LWL is used. This low-water-loss cement helps prevent loss of fluids into formations and other dehydration problems.

Let a Drilling Specialties technical advisor help you select the particular grades of Driscose and Diacel best suited to your drilling and completion operations. Driscose and Diacel are available through your regular suppliers.

DRISCOSE DIACEL

**DRILLING SPECIALTIES COMPANY**

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spudded 66 miles west of the first, and west of the Jordan-Dead Sea depression, on Jan. 6, 1958. Parker Drilling Company was the contractor for both wells.

Late in 1957, a 55-year concession covering another one-third of Jordanian territory was granted, reportedly to Jorge Zimei, a Guatemalan. It was understood that the concession would be assigned to J. W. Sparks, independent oil operator of Gladewater, Texas. However, after publication of the concession in the official gazette in March, 1958, it was said that the concessionaire had six months to select its one-third area of Jordan remaining from the two-thirds forfeited in 1956 by Pauley, and that no transfer of these rights had been made at that time.

### Aden Protectorate

GEOLOGICAL AND seismograph surveys reportedly were carried out in the Aden Protectorate during 1957 by BP Exploration Company Ltd., following geological, gravity and magnetic surveys made during 1956 in the Kamaran Islands in the Red Sea.

In June, 1958, work began on a 20-mile, 6-inch pipe line to carry fuel gas from BP's Aden refinery to a power station at Hedjuff, which formerly operated entirely on oil.

### Oman

IN MAY 1957, Petroleum Development (Oman) Limited, affiliate of Iraq Petroleum Company Ltd., abandoned the extremely remote Jebel Fahud test at a total depth of 12,235 feet. The test, spudded in 1956, was located at Longitude 56° 30′ East, Latitude 22° North. A new location was made in October, 1957, on the Ghaba structure, about 85 miles southeast of Fahud. Rigging up was completed by the end of February, 1958.

During 1957, a total of seven party months of geological surveys, 22 party

See Insert Map

months of reflection seismograph work, ½ month of refraction seismic, and 24 party months each of gravity and ground magnetic work was conducted in Oman. In addition, 1,365 square miles were mapped by photographic surveys.

Petroleum Development's exploratory efforts are hampered not only by the extreme remoteness and rugged weather conditions in Oman but also by intermittent civil strife. British troops were flown into Oman during the summer of 1957 to put down an outbreak against the regional government. Another flareup was reported in March, 1958. Land mines were reported to cause enough of a hazard and a nuisance to cause supply routes for oil exploration to be slowed.

### Syria

SIGNIFICANT PROGRESS was made toward the development of a balanced domestic oil industry in Syria during 1957 and 1958. Extensions were completed to the Karatchok oil field, discovered in 1956 by MenHall Prospecting and Exploration Company. Work on a new refinery at Homs, to be built


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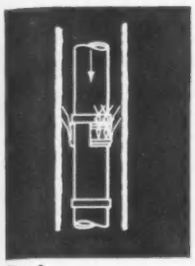

Fig. A

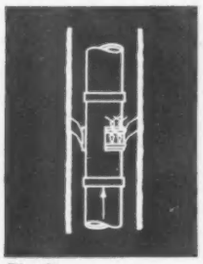

Fig. B

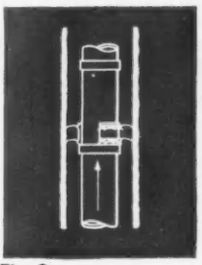

Fig. C

**Fig. A** Scratcher wires, retained by integral hinged mounting, swing freely upward and do not remove mud cake while running in.

**Fig. B** Even when casing is lifted out of the slips, the entire Scratcher remains stationary. Only when reciprocated, and

**Fig. C** ...only at the cementing area does the "scissors" action of the crossed wires remove mud cake.

**Baker Scratchers remove mud cake only from the cementing area; this "controlled scratching" protects productivity.**

While running in, the scratcher wires automatically swing upward along the casing, where they are safe from damage; permit free, unrestricted lowering of the casing; and do not disturb or remove mud cake. There is no danger of "balled-up" mud collecting on the scratcher wires to plug the annulus and contribute to pressure surges with possible "mudding-off" of the producing zone. Only when the cementing area is reached and the casing is reciprocated do the double rows of strong "crossed" spring wires automatically reach out, dig in, and remove the mud cake with efficient "scissors" action.

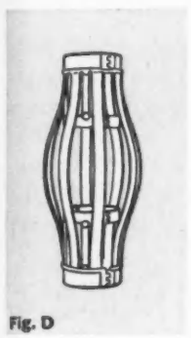

Fig. D

Fig. E

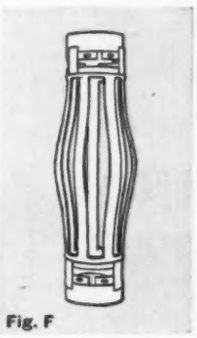

Fig. F

**Fig. D** "Extended" Range HINGE-LOK Baker H-25 Casing Centralizer. Product No. 9113.

**Fig. E** "Normal" Range HINGE-LOK Baker H-20 Casing Centralizer, Product No. 9112.

**Fig. F** "Slim Hole" SOLID-RING Baker G-15 Casing Centralizer, Product No. 910-G.

**Baker Centralizers assure cementing clearance. "No-scrape" design prevents "balling", plugged annulus and stuck casing.**

The QUALITY of Baker Casing Centralizers starts with "sled-runner" springs made of high quality spring steel—tested and pre-set by flattening in hydraulic presses—then butt-welded to collars to form a unit of great strength. Pre-setting of the springs to the pre-calculated optimum bowed height enables each centralizer to pass tight spots or dog legs without damage to the assembly, and ensures GREATER CENTERING FORCE for maintaining annular clearance for cementing.

Baker Centralizers do not remove mud cake which could plug the annulus, contribute to pressure surges and restrict productivity.

# BAKER OIL TOOLS, INC.

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Fig. G

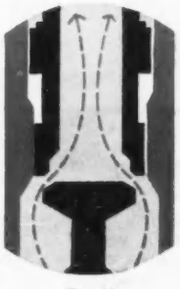

Fig. H

**Fig. G** Variable FILL-UP Valve as used in FLEXIFLOW Equipment.

**Fig. H** Variable FILL-UP Valve as used in DIFFERENTIAL Equipment.

**Baker Fill-Up Equipment saves time in running casing, but does not create pressure surges that reduce productivity.**

Destructive pressure surges—often created when casing equipped with conventional floating equipment is lowered into the well—can now be avoided. The Variable Valve in either Baker DIFFERENTIAL or Baker FLEXI-FLOW "Fill-up" Shoes and Collars, permits casing to fill from the bottom up; eliminates expensive, time-consuming surface filling; and automatically coordinates the *rate of fill* with the *rate of lowering* to AVOID high pressure surges. Baker FILL-UP Equipment permits the casing to be lowered at normal rates, saving rig time and reducing danger of sticking the pipe; chances for successful primary cementing are increased; formations are protected from high pressure surges which can impair their productivity.

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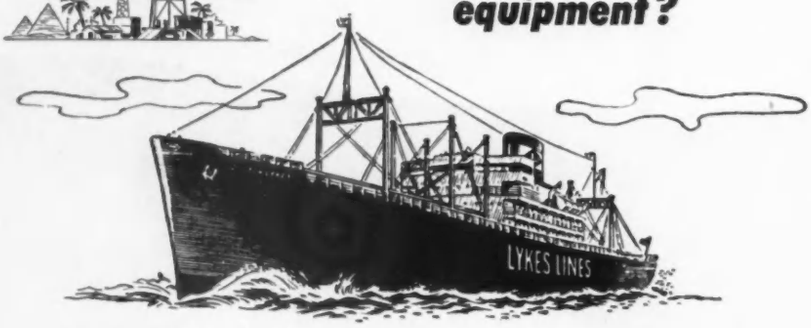


If you are "going foreign" with oilfield equipment, utilize Lykes' fast, modern American flag vessels serving overseas areas having exploration activity. Lykes' six world-wide routes include Turkey, Egypt, Libya, Tunisia, Algeria and other Mediterranean areas, Continental Europe, Caribbean area and South America. Lykes offers you many years of shipping experience to insure efficient handling of your equipment.

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OFFICES AND AGENTS IN PRINCIPAL WORLD PORTS


by the Czech Technoexport group, was reported started in May, 1958. Exploration in northeastern Syria was being accelerated by U. S., West German, and Soviet technicians. It was too early to assess the merger of Egypt, Syria and Yemen into the United Arab Republic as to its effect on the oil search in Syria.

**MenHall group activities.** The MenHall firm consists entirely of U. S. capital, with J. W. MenHall of Benton, Ill., and Atlantic Refining Company holding the main interests, and Cyrus Eaton-Portsmouth Steel interests participating on a minority basis. MenHall Prospecting and Exploration Company holds exploration permits in 11 rectangular-shaped tracts of about 117 square miles each in northeastern Syria, aggregating about 800,000 acres. Three of the tracts in the extreme northeast corner of Syria are contiguous and contain the Karatchok oil field. Another contiguous block of three 117 square mile permits lies a few miles to the southwest. Five other isolated tracts lie to the south roughly parallel to the Iraq border.

Initial discovery at Karatchok 1 was made late in 1956 when about 90 feet of oil pay was found in fractured Cretaceous limestone between 6,500 and 6,780 feet. The well was still being tested in 1957 and was believed capable of producing more than 1,000 barrels daily of 22 gravity oil.

Karatchok field is located on a pronounced surface structure about 15 miles long and five miles wide, with an east-west trending axis.

It still was not known whether the entire structure would be oil-bearing, but no salt water in the pay zone had been reported by mid-1958. Karatchok 2, located 1½ miles west of Well 1, was completed late in 1957, and appeared to be a producer very similar to the discovery well. Continuous 1½-mile stepouts were being drilled at Wells 5 and 4, which found oil in 1958.

The westerly wells were reported to be structurally higher, with considerable gas being found in Karatchok 4, the westernmost completion. A shallow test, Karatchok 3, located 1½ miles east and apparently down-structure from the discovery, was drilled to 4,500 feet. It may be deepened to the pay zone later.

If current negotiations with the


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Both rigs are equipped with hydraulic torque-converters for smooth, flexible, shock-free operation. Both are so compact that they can easily be trailer-mounted—a practical arrangement that gives them complete and instant mobility. Write for details.

**ENGINEERING DATA**

| | S-45-E | C-50 |
|---|---|---|
| Recommended input hp (engine) | 300 | 450 |
| Brake rim diam and width, in. | 36 x 7½ | 42 x 8⅜ |
| Arc of brake lining contact, degrees | 330 | 330 |
| Brake cooling, type | Spray | Full-flow |
| Length of drum spool, in. | 40 | 41 13/16 |
| Diam drum spool, in. (grooved for 1-in. line) | 14 23/32 | 16 23/32 |
| Low-speed drum clutch, torque capacity, ft-lb | 16,800 | 31,280 |
| High-speed drum clutch, torque capacity, ft-lb | 8,400 | 31,280 |
| Diam drum shaft, in. | 5 | 6½ |
| Lubrication: | | |
| Bearings | Grease-packed | Grease-packed |
| Chains | Flood-oiled | Flood-oiled |
| Upper drum assembly | Optional | Optional |

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## Drilling and Production in Syria in 1957

| COMPANY | 1957 Crude Oil Production | Number of Crude Oil Wells as of End of 1957 | | Number of Field Wells Drilled in 1957 | | | | Number of Wells Drilling as of 12-31-57 | Amount of Footage Drilled During 1957 |
|---|---|---|---|---|---|---|---|---|---|
| | | Shut in | Total | Oil | Gas | Dry | Total | | |
| MenHall Prospecting and Exploitation Company | None | 2 | 2 | 1 | 0 | 0 | 1 | 2 | 10,000 |
| Societe des Petroles Concordia S.A.R.L. | None | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8,212 |
| Total | None | 2 | 2 | 1 | 0 | 0 | 1 | 3 | 18,212 |

government for an exploitation concession are successful, MenHall et al is expected to renew vigorous drilling activity. At the start of 1958, two rigs were being operated under lease from the Syrian government, and there were two small company rigs rated to about 5,000 feet. There was no commercial crude oil production from the field during 1957.

**Exploration by German interests.** Société des Petroles Concordia S.A.R.L., a Syrian company affiliated with Deutsche Erdoel of West Germany, has exploration permits covering about 5,000 square miles in northeastern Syria. The tracts are not all contiguous, but they generally surround MenHall's blocks and extend farther west. Seismic evaluation of Concordia's acreage began in 1957, and two seismograph parties were working on its permitted areas by mid-1958.

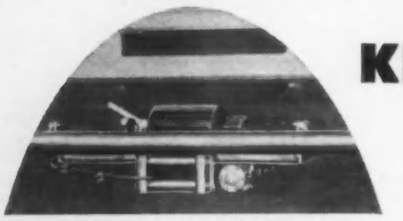
El Bouab 1, Concordia's first wildcat, was spudded last year 75 miles west-southwest of Karatchok field and 13 miles northeast of Hassetche. The test had reached 8,212 feet by the end of 1957 and was drilling ahead at 11,489 feet by the end of May, 1958. At this depth, it was thought to be

See Insert Map

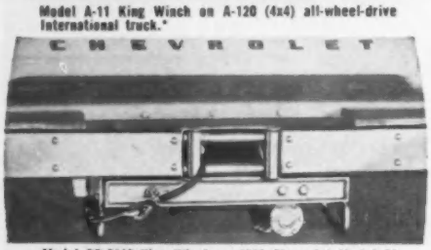
below the Permian. Concordia was rigging up on a second wildcat, Cheikh Sollakh, and had made location for a third.

Generally, the Karatchok field is part of a currently "hot" Cretaceous trend, with Mosul Petroleum Company drilling in the Butmah-Ain Zalah area in nearby northwestern Iraq, and with several companies carrying out exploratory activity across the border in Turkey to the north.

**Soviet technicians.** During 1957, the Syrian government agreed to accept Russian technical help to explore for oil in northeastern Syria. The Russians are obligated, according to the *Bulletin* of the American Association of Petroleum Geologists, to complete a map of northeast Syria on a scale of 1:200,000. They are also to shoot 1,250 miles of seismic profiles, drill 18 wells of between 4,500 and 18,000 feet of depth for a total of 118,000 feet of hole. The deal is also said to include construction of 157,000 barrels capacity of oil tankage at Latakia.

Model A-11 King Winch on A-120 (4x4) all-wheel-drive International truck.*




Model CD-8116 King Winch on 1958 Chevrolet Model 31 (4x4).

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* *King Winches for International trucks are available through International-Harvester dealers.*

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## Trucial Coast

PETROLEUM DEVELOPMENT (Trucial Coast) Ltd., an Iraq Petroleum Company Ltd. affiliate, continued exploratory activity during 1957 and 1958. Shuweihat 1, located near the coast between Gezira and Murban at Longitude 52° 30′ East, Latitude 24° 05′ North, spudded in 1956, was abandoned in November, 1957, at 12,360 feet.

**See Insert Map**

A third test, Juweiza 1, located 20 miles inland from Sharjah was spudded August 30, and had reached 4,909 feet at the end of December, 1957.

Renewed interest in the Murban vicinity west of Abu Dhabi, where the first test encountered high-pressure gas several years ago, was indicated by the completion of rigging-up operations on a second test five miles southeast of Murban 1.

Eight party months of reflection seismograph work also was reported in 1957 by Petroleum Development (Trucial Coast) Ltd.

## Yemen

YEMEN DEVELOPMENT Corporation, composed entirely of U. S. interests, conducted some surface geological exploration in Yemen during 1957. The Safir Basin, located in the interior northeastern part of Yemen along the Aden Protectorate frontier, originally was thought to be prospective oil area. Surface exploration there has uncovered interesting indications of a number of minerals, but the feasibility

**See Insert Map**

of economic development, in view of the remoteness of the area and the intermittent strife between the Yemeni and the British, was in question.

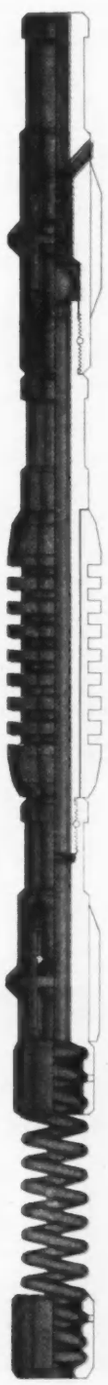
The company became more interested in acquiring a concession on the Tehama Red Sea coastal strip between Hodeida and Maidi, relinquished by Yemen Deilmann Petrol (West German interests) in 1956. However, the Yemen government was not inclined to grant the concession. Furthermore, the government advised the company during the spring of 1958 that it would cancel the 40,000-square-mile interior concession granted in 1955 on grounds of non-development. Under the agreement, the company has three months after such notice to accelerate development. But whether U. S. interests would remain in Yemen was doubtful as of June, 1958.

## Lebanon

COMPAGNIE LIBANAISE des Petroles, a Lebanese firm headquartered in Beirut, held a 75-year concession covering various areas in Lebanon pursuant to an agreement with the Lebanese government in 1955. CLP was obligated to drill at least 29,527 during the first three years, and 9,842 feet annually as of the fourth year.

Early in 1958, CLP invited bids from interested contractors to drill the 29,527 feet of hole the first year in Lebanon, commencing on or about July 1, 1958. Test wells would vary in depth between 4,000 and 8,000 feet. Generally, any such contract was to be on a turnkey basis with the contractor paying virtually all operating expenses. Drilling of wells would be supervised by CLP geologists. Deadline for submission of bids was April 15, 1958.

The Lebanese consulate in New York advised that a number of pro-

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posals had been submitted. However, civil unrest in Lebanon at midyear was bound to have a dampening affect on contractors' enthusiasm for drilling.

## Abu Dhabi

By mid-June, 1958, Abu Dhabi Marine Areas Ltd. had drilled its first offshore test in the Persian Gulf into Cretaceous beds and to below 7,900 feet in search of the Arab Zone of the Jurassic. Two oil shows were found in the Cretaceous section. Amid many reports that an oil discovery had been made, it was known that equipment to complete a high-flow oil well was being purchased. Hence, it was expected that the announcement of a discovery, the third in the Persian Gulf offshore, would be made.

**See Insert Map**

Abu Dhabi Marine Areas Ltd. is owned two-thirds by The British Petroleum Company Ltd., and one-third by Compagnie Francaise des Petroles. The test well is located 20 miles east of the tiny base island of Das, which, in turn, is located 60 miles offshore from Abu Dhabi. Das is 170 sea-miles from Bahrain. If the discovery is confirmed, it will represent the eastern-most of Persian Gulf area oil fields, replacing Qatar's Dukhan field with that distinction. Moreover, it will extend a prolific Mesozoic producing trend about 175 miles further to the east, if successful.

This venture culminates activity begun in 1953 when Shikh Shakbut bin Sultan bin Zaid granted about 1,200 square miles in concessions in Persian Gulf waters offshore from Abu Dhabi. In 1954, marine seismic, geological, gravity, and other surveys were carried out. Drilling had to commence before March 9, 1958, within five years of the date of the concession, according to its terms.

The drilling platform used for the Das test incorporated hydraulic jack design. The builder was Gutehoffnungshutte Sterkrade Aktiengesellschaft, of West Germany. The barge was launched at Audorf on the Kiel Canal on April 11, 1957, and was towed by tug 6,800 miles to the Persian Gulf via the Suez Canal. The barge left Audorf on August 24, arriving at Das Island late in November. By Jan. 14, 1958, the first test, known as Adma Well F-1, had been spudded in.

The barge, called Adma Enterprise, supports a 140-foot drilling unit rated to 15,000 feet. The barge has four retractable legs, 10 feet in diameter and 165 feet long, enabling the outfit to drill in 80 feet of water depth.

## Hadhramaut

Some exploratory activity was reported in Hadhramaut, which consists of about 25 sheikdoms under British protectorate known as Aden Protectorate, Eastern section. The area lies on the south coast of the Arabian peninsula west of Dhofar and east of Aden proper.

**See Insert Map**

Petroleum Concessions (Hadhramaut) Ltd., an affiliate of Iraq Petroleum Company Ltd., has a number of exploration licenses that cover most of Hadhramaut except certain parts of the western area. The licenses are renewed periodically.

Petroleum Concessions (Hadhramaut) Ltd., reported 6½ party months of geological surveys, 24 party months of gravity work and six party months of surface magnetics during 1957. In addition, 14,820 square miles were mapped through photographic surveys.

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# Australia . . .

## Exploration continuing

ALTHOUGH NO commercial crude oil or natural gas discoveries occurred in Australia in 1957 or during the first half of 1958, exploration operations were being continued.

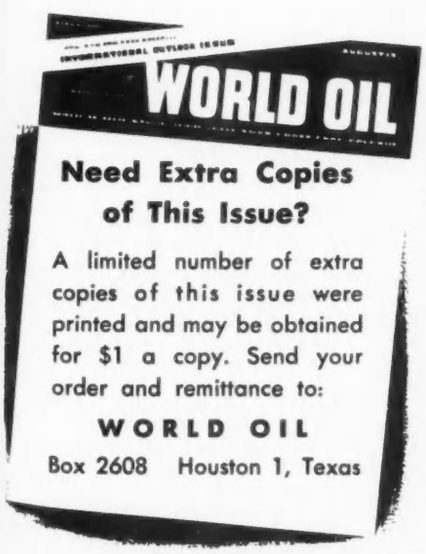
West Australian Petroleum Pty. Ltd. has spent almost $40 million since it began operations in Western Australia. By mid-1958, it had drilled 25 deep wells and 31 structure tests, totaling almost 200,000 feet of hole.

By May, 1958, Samphire Marsh 1, WAPET's deep test in the Canning Basin, had been abandoned as a dry hole at 6,666 feet. The rig was being moved to Meda, 40 miles east of Derby.

Meanwhile, a WAPET refraction seismograph was working at Jurgurra Creek, about 100 miles east of Broome.

WAPET and Frome Broken Hill Pty. Ltd. accounted for most of the exploration operations last year. Other companies which conducted activities were Westralian Oil Company, Australian Mining and Smelting Company Ltd., Australian Oil and Gas Corporation, Ltd., Santos Ltd., and Clarence River Basin Oil Exploration.

At the end of April, 1958, Santos Ltd., which was continuing to drill at Haddon Downs in South Australia, reportedly was negotiating an agreement with Delhi-Taylor Oil Corporation of Dallas under terms of which the latter would enter the exploration activities in South Australia.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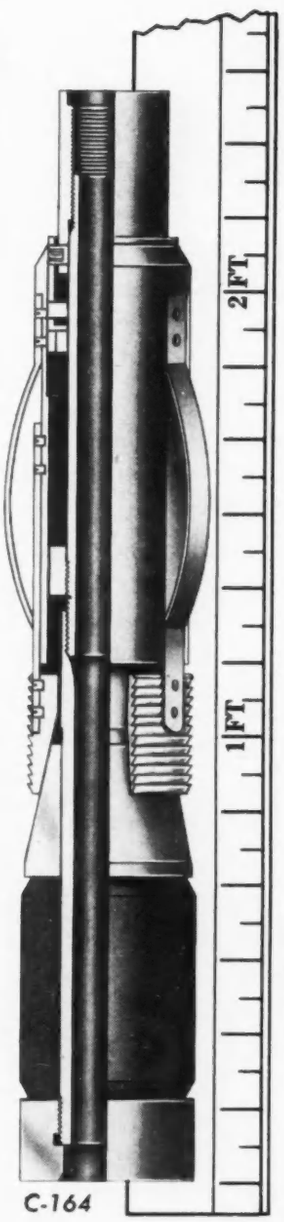


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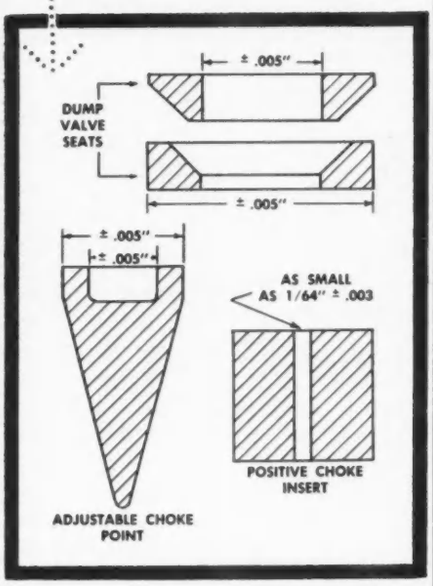


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# Burma . . . Crude output spirals

BURMA'S OIL industry began to show real results from the patient, painstaking repair work conducted since 1945, after most of its facilities were demolished during World War II. Crude oil production reached 2,609,875 barrels during 1957, including 2,500,375 barrels (6,850 barrels daily) produced by Burmah Oil Company (1954), and an estimated 109,500 barrels (300 barrels daily) produced by local operators in the Yenangyaung field. The 1957 total represents an impressive 48.8 percent increase over the amount estimated for 1956.

An important reason for the increase was the completion of a new 3,500-barrel-daily crude distillation unit at the Syriam refinery. The Syriam refinery is jointly owned by Burmah Oil Company (1954) Ltd. and the Burmese government. The new plant partially replaces the former 21,000-barrel-per-day Syriam refinery that was demolished in World War II.

The 275-mile Chauk-Syriam pipe line, also destroyed during the war, was still not returned to service as last year closed. The government owned Inland Water Transport moved crude to Syriam, using a fleet of oil barges with pusher tugs to ply the Irrawaddy River between Chauk, Lanywa and Yenangyaung fields and the Rangoon-Syriam vicinity near the mouth of the Irrawaddy River.

A topping plant at Chauk field continued to operate, running part of Burmah Oil's yield. All of Burmah Oil's production was from Chauk and Lanywa fields.

During 1957, Burmah Oil Company drilled 16 development wells in Chauk and Lanywa and continued to recondition old wells.

**Exploration.** Exploration, renewed in recent years, became more active. Burmah Oil conducted four party-months of reflection seismic work in the Irrawaddy River delta, and a location at Kyaiklat was staked pursuant to this work. The first test on this prospect was to be drilled in 1958.

In December, Ondwe 5 was spudded near the east shore of the


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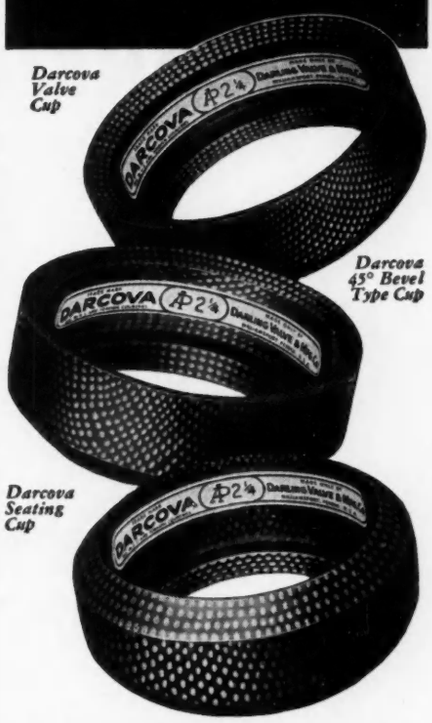


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Irrawaddy, due east of Minbu field and southeast of Yenangyaung. This test had reached 4,201 feet by the end of the year and had found some gas shows. The steam rig's boilers were operating on gas from a shallow well (Ondwe 6).

About 200 wells were reported on production in Chauk and Lanywa fields during 1957, including 186 on pump and 14 flowing. An estimated 40,000 feet of hole was drilled in Burma in 1957.

# Red China . . . 1958 oil discoveries 100 miles from Chungking are reported

HARD-WROUGHT progress was made during 1957 and 1958 in Red China's oil industry, hampered by shortages of capital, technicians, modern equipment and by the generally vast, unconnected distances between newly-found sources of crude oil and markets in populated areas.

Petroleum production of all types was reported at 10.2 million barrels during 1957, an average of 27,945 barrels daily. However, oil from shale and coal are said to comprise about 35 percent of China's petroleum production. Shale oil production at Fushun in the northeast reportedly has amounted to as much as 6,000 barrels per day in recent years. Production from shale and coal is being pushed, and it may be increased by 150 percent within the next four years.

China's 1958 economic plan calls for petroleum production of 10.85 million barrels, with natural crude accounting for 56 percent of the total. In addition, 1.15 million feet of exploratory drilling and 425,000 feet of development drilling were planned for 1958.

There was considerable interest in oil discoveries reported in March, 1958, near Nanchung in Szechwan Province, about 100 miles north of Chungking. Strong emphasis apparently was being placed on rapid development of these fields. Should they prove to represent a large reserve, it would be the first of several oil discoveries made in recent years to be located in a populated, developed area where it is sorely needed.

Exploratory activities spread over China's vast regions—to Sinkiang, where drilling in Karamai field, at Uerho, and other localities was being pushed vigorously and where a 35-mile pipe line has been laid to storage facilities at Kul; to the Tsaidam basin in Chinghai province, where oil has been reported struck at Yuchuantze, Lenghu, and Mannai; to the Kiuchuan basin in Kansu province, where Laochunmiao field near Yumen produced about half of the nation's output in 1957 and where many field parties were working in search of new fields; to Tibet, and the Gobi Desert, where reconaissance work was reported.

Many technicians from Russia, Czechoslovakia and other Russian satellite nations were aiding the Chinese oil industry, but such help was reported to be diminishing, with many of the foreign technicians returning


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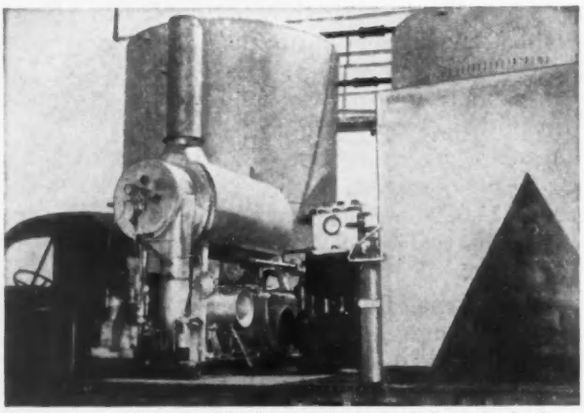

This model 25M Texsteam Texheater is in service in the Sherman, Texas, pool. It is manufactured by The Texsteam Corporation, Houston, Texas.

WIDELY used in the oil fields, this versatile heating unit has many applications . . . where quick, sustained heat is required. It is extensively employed to heat oil that is emulsified with water so that the added chemical will be immediately effective. It is also used for heating oil that has a tendency to deposit amorphous paraffin and thus clog up pipelines and connections.

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nome without replacements being offered.

A 550-mile pipe line to carry crude from Yumen to Lanchow was scheduled for completion in 1957, and a new refinery at Lanchow was to go on stream about the same time.

A new refinery in the Tsaidam Basin at Lenghu, in a marshy, remote area about 9,000 feet above sea level between the Nan Shan and Lun Shan Mountains, was under construction in 1957 and reported completed in 1958.

## India . . . Crude production up 18.8 percent as Assam oil fields make up for Digboi drop

SOME PROGRESS continued to be made toward reducing India's need to rely almost entirely on imports to fulfill its oil needs, but there was little apparent interest on the part of private companies to enter India to develop its oil resources. Oil is included in a list of industries the future development of which would be the exclusive responsibility of the state. Exploration for oil is being undertaken by the Oil and Natural Gas Commission of the Indian government. The government also is involved in participatory projects with Standard-Vacuum Oil Company and Assam Oil Company to conduct exploration in West Bengal and Assam, respectively.

**Production.** Crude oil production in India during 1957 amounted to 3,407,373 barrels, for a daily average of 9,335 barrels daily representing an 18.8 percent boost over the 7,857 barrels daily rate in 1956.

Production from the old Digboi field declined, to 2,165,279 barrels (5,932 barrels daily) during the year, from 6,600 barrels daily in 1956. Production from the new Assam fields discovered since 1953 more than made up the deficit, however. Production, mainly from Nahorkatiya field but also from Moran and Hugrijan, amounted to 1,242,094 barrels, or 3,403 barrels daily, almost double the 1,841 barrels daily rate of 1956. The new discoveries have raised India's crude oil reserves to about 300 million barrels by mid-1958. Crude production from Nahorkatiya, Moran and Hugrijan was expected to surpass Digboi's in the near future.

A total of 573 wells were reported on production at Digboi in 1957, including 37 flowing wells and 536 on pump. Three flowing wells in the other fields were reported, with 20 wells shut in awaiting an outlet.

**Assam drilling.** Assam Oil Company, a subsidiary of The Burmah Oil Company Ltd., completed eight exploration and extension wells in the Nahorkatiya vicinity to depths of about 10,000 feet. Four of the wells were potential oil producers, two were gas wells, one was a marginal oil well, and one test was dry. At Moran, five wells were completed to 12,000-foot depths, including three oil wells and two dry holes. At Digboi, six development wells were completed, and a deep test was begun late last year. Total estimated drilling footage pursuant to these operations was 161,000 feet.

**Assam exploration.** Assam Oil Company completed eight party-


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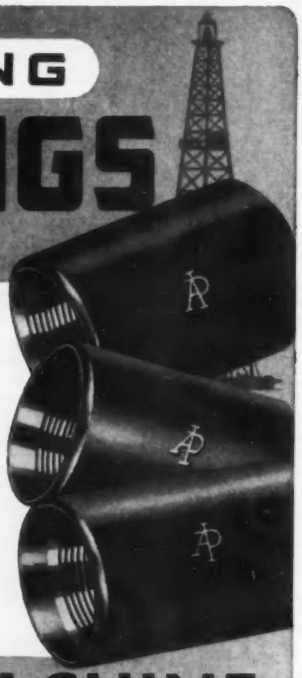

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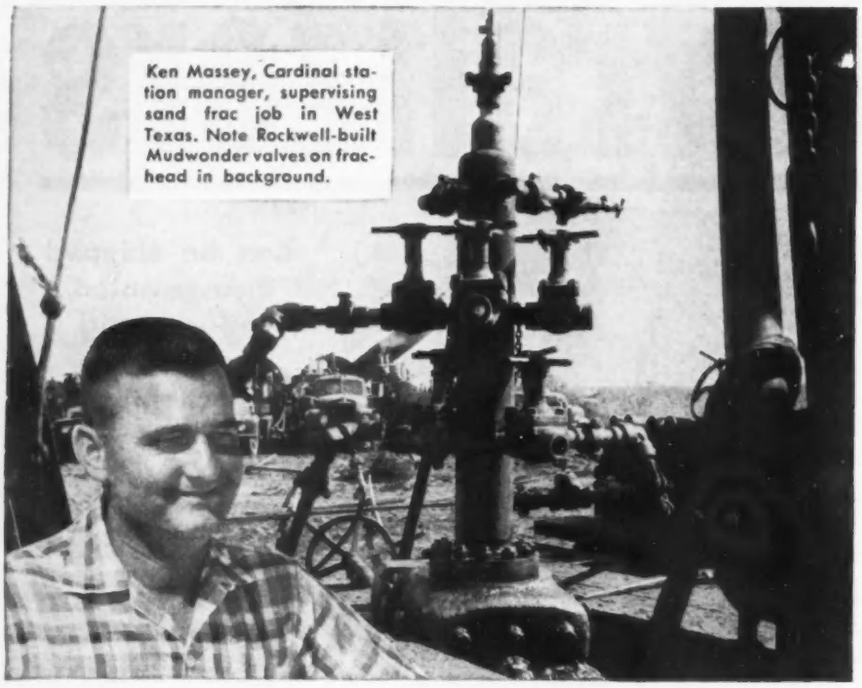

Ken Massey, Cardinal station manager, supervising sand frac job in West Texas. Note Rockwell-built Mudwonder valves on frac-head in background.

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by Kenneth Massey,
Odessa Station Manager
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WE fracture oil wells. It's our job to get the maximum number of barrels pumped in the shortest possible time. That's why we use the best, most dependable equipment available—and drive it hard. When we finish pumping the sand frac fluid in under high pressure and close the well-head valves, we've got to be *sure* they don't leak. For two years now, we haven't had to worry. We find that well pressure never bleeds off when our Mudwonder valves are closed. There's no need to bump them shut or use a "cheater" to get drop-tight shut-off.

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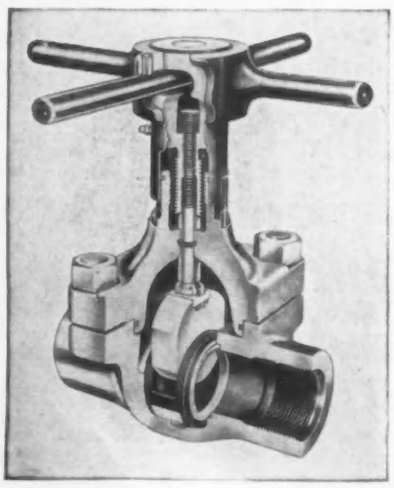
**Mudwonder cut-away view shows the one-piece seat insert, with Buna-N molded integrally over steel wear rings; chromed gate with "T" slot connection; separated stainless stem and double thread construction.**



ADV.


months of reflection seismic work in upper Assam during 1957, mainly in the Moran and Hugrijan concessions. Other work was concentrated on the east plunging end of the Digboi fold.

**New facilities for Assam's oil.** The question of how best to refine and move to markets the new-found crude in the upper Brahmaputra River valley was the subject of long negotiations between Assam Oil Company and the government. It was formally settled in an agreement signed on Jan. 14, 1958. A new company, Oil India Private Limited, shared two-thirds by Burmah Oil Company and one-third by the Indian government, will develop Nahorkatiya, Hugrijan and Moran.

The government plans to build two refineries, one at Gauhati in Assam, about 250 miles downstream on the Brahmaputra from Nahorkatiya, the other at Barauni on the Ganges River in Bihar, about 550 miles west of Nahorkatiya.

The Barauni refinery project was less definite, but a capacity of 30,000 barrels daily was envisioned.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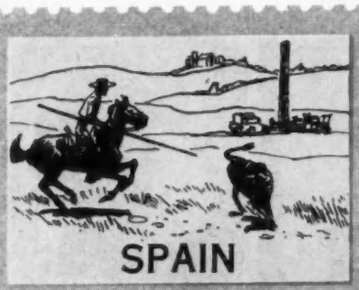
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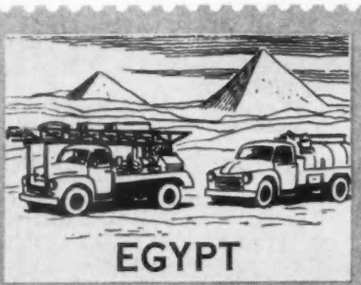
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**Digboi refinery.** Throughput at the Digboi refinery was reported at 3,258,830 barrels during 1957, an average of 8,928 barrels per day.

**Exploration by Stanvac.** Standard-Vacuum Oil Company completed two dry holes at an average depth of 6,586 feet in 1957, and was drilling another test at the end of the year that also was abandoned as dry in 1958. A fourth test was being drilled as of midyear.

The first test, Burdwan 1, was spudded on a 10,000 square mile concession in West Bengal on April 18, 1958.

The second test, Galsi 1, was located 21 miles northwest of Burdwan. Galsi was drilled to 4,250 feet and was abandoned in October after some testing had been completed.

The next test, Jalangi 1, located 105 miles north of Calcutta, was spudded Nov. 24, 1957, and was drilling below 6,800 feet at the end of the year.

**Production and Drilling in India in 1957**

| COMPANY | Crude Oil Production in 1957 (Barrels) | Daily Average Production (Barrels) | NO. OF WELLS COMPLETED DURING 1957 AND RESULTS | | | | Amount of Footage Drilled In 1957 |
|---|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total | |
| Assam Oil Company, Ltd. | 3,407,373 | 9,335 | 14 | 2 | 3 | 19 | 161,000 |
| Digboi | 2,165,279 | 5,932 | .. | .. | .. | .. | ..... |
| * Nahorkatiya, Moran, and Hugrijan | 1,242,094 | 3,403 | .. | .. | .. | .. | ..... |
| Standard-Vacuum Oil Company | ..... | ..... | .. | .. | 2 | 2 | 19,980 |
| Oil and Natural Gas Commission, Indian Government | ..... | ..... | .. | .. | .. | .. | 6,000 |
| Total | 3,407,373 | 9,335 | 14 | 2 | 5 | 21 | 186,980 |

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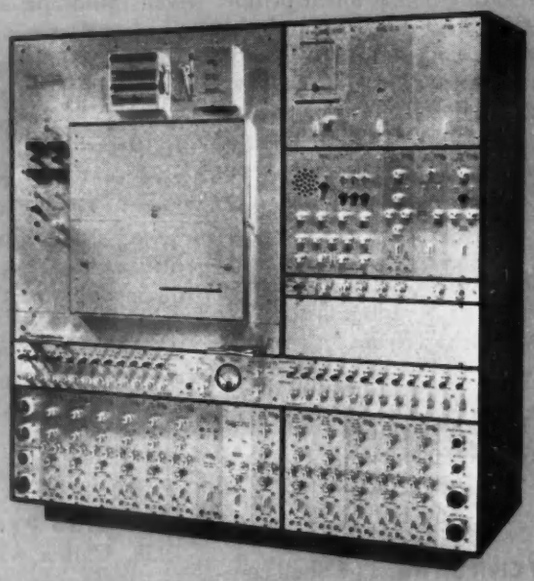
**Oil search by government.** The Oil and Natural Gas Commission began a comprehensive program to find oil in India during 1957 and 1958. After detailed geological mapping, drilling was begun in July at Jwalamukhi in the Punjab. A Rumanian rig and crew were in use. The location is in the foredeeps south of the Himalaya Mountains, near a gas seep. Difficult drilling was encountered, but the well reached 6,000 feet by the end of the year.

In May, 1958, Jwalamukhi 1 was reported to have found gas below 6,000 feet, with good formation pressure.

In 1957, the Commission sent out five gravity parties (including one Russian), a Russian seismograph crew and 10 geological field parties into Punjab, Cambay, Cutch and Rajasthan. By 1958, there were eight gravity parties, six seismic crews and 15 geological teams. Uttar Pardesh and Assam were also being explored in 1958 by some of these crews. Some structure drill work and deep tests were expected to follow on some prospects located. Drilling was proposed for Hoshiarpur in the Punjab, at Cambay in Bombay State and at Sibsagar in Assam during 1958. Three deep drilling rigs have been procured from Russia, in addition to the Rumanian rig operating at Jawalamukhi.

**Oil imports.** India imported about 75,000 barrels of crude and 40,000 barrels of products daily during 1957, and imports were expected to rise under the industrialization programs being planned and executed.



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SIE

# Indonesia and British Borneo

## . . . Exploration shut down; changes reported

CONSIDERABLE progress was made in Indonesia during 1957 and 1958, as development projects, long planned, reached fruition. Standard-Vacuum Oil Company completed an 8-inch, 90-mile crude oil pipe line from Lirik field in central Sumatra, previously shut in, to Buatan terminal on the Siak River. Caltex Pacific Oil Company was scheduled to put into operation in July, 1958, a 30-mile, 30-inch crude oil pipe line between Duri field in central Sumatra and the newly-built Dumai marine terminal on the northeast coast.

Exploration activities were largely shut down pending governmental approval of legislation designed to clarify conditions under which new concessions may be granted. Refinery expansion and overhaul operations were limited to facilities to fulfill current products needs, in view of the unfavorable political climate for private investment, and intermittent civil strife.

**Royal Dutch Shell.** The two Shell group members operating in Indonesia, N V de BPM (Shell) and N V N.I.A.M., continued development drilling, producing and refining operations at about the same rate as in recent previous years. Average crude oil production during 1957 was 102,913 barrels daily, a slight decrease from the previous year, representing gradual depletion of Shell's fields not offset by new drilling. In December, 1957, Shell's production had dropped below 100,000 barrels daily.

The Shell companies completed 75 wells aggregating 359,364 feet of hole during 1957. More than half of this footage was drilled in Limau field in South Sumatra, where 30 oil wells and two dry holes were completed last year for a total of 185,559 feet of hole. A total of 23 oil fields was being produced by Shell last year in Indonesia.

**Reorganization of BPM.** In March, 1958, interests of N V Bataafsche Petroleum Maatschappij in Indonesia were absorbed by a new Shell group company, Persepan Terbatas Shell Indonesia. Headquarters are in Djakarta. Articles of association were submitted to the Indonesian Ministry of Justice.

**Effects of Civil Strife.** The Shell companies suffered minor damage and disruption during the several periods of civil unrest in Indonesia in 1957 and 1958. Early this year, damage was reported to a storage depot in northern Celebes. On April 28, two tankers were bombed at Balik Papan, where the refinery and Bunju and Tarakan oil fields were shut down for two weeks thereafter.

**Caltex Pacific Oil Company.** Caltex boosted production from Minas field in Central Sumatra to a total of 53,710,495 barrels during 1957, for a daily average of 147,152 barrels, representing a 66 percent increase over the 1956 rate. It was believed that Minas had reached full development and optimum producing rate by midyear 1958.

Caltex had 90 wells flowing and 60 wells pumping at the end of 1957. A total of 81 were shut in awaiting outlet (mainly in Duri field). Caltex completed 52 wells during 1957, with drilling concentrated in the shallow (800 feet) Duri field. At the beginning of 1958, it was considered possible that 100 wells would be completed this year at Duri field. As drilling has been concentrated at Duri during the past several years, there were about 100 wells capable of production there by midyear 1958. In Bekasap field, near Duri, only three wells were capable of production as of midyear 1958. Caltex drilled 40,800 feet of hole in Indonesia last year.

**Pipe Line Projects.** On July 15, 1958, Caltex was scheduled to place in operation the 30-mile, 30-inch crude oil pipe line from Duri field to the new marine terminal at Dumai on the northeast coast of Sumatra. This project had been underway since March, 1957, when International Bechtel Inc. of San Francisco, contractors, began work on this coastal-swamp area pipe line (see WORLD OIL, May, 1957, Caltex Line to Link Sumatra Fields, Port, page 235).

**Royal Dutch Shell's Drilling and Producing Operations in Indonesia in 1957**

| Name of Company | Field | Location | Year Discovered | Footage Drilled in 1957 | Total Wells Completed in 1957 | Oil | Gas | Dry | Wells Drilling 12-31-57 | Wells Producing 12-31-57 | Total 1957 Crude Production in Barrels | Average Production 1957, Barrels Daily | Crude Production, Barrels, Daily, December, 1957 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N. V. De BPM (Shell) | Kawengan | Java | 1926 | 2,908 | 1 | 1 | 0 | 0 | 0 | 84 | 2,471,630 | 6,772 | 5,580 |
| N. V. De BPM (Shell) | Kruka | Java | 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 204,450 | 560 | 500 |
| N. V. De BPM (Shell) | Anggana-Muara | Kalimantan | 1902 | 0 | 0 | 0 | 0 | 0 | 0 | 86* | 582,870 | 1,597 | 1,491 |
| N. V. De BPM (Shell) | Balik Papan | Kalimantan | 1903 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 1,950 | 5 | 0 |
| N. V. N. I. A. M. | Bunju | Kalimantan | 1930 | 12,818 | 3 | 2 | 1 | 0 | 0 | 31 | 3,655,280 | 10,014 | 9,080 |
| N. V. De BPM (Shell) | Sambodja | Kalimantan | 1910 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 362,490 | 993 | 960 |
| N. V. De BPM (Shell) | Sanga Sanga | Kalimantan | 1897 | 0 | 0 | 0 | 0 | 0 | 0 | 88† | 1,020,670 | 2,796 | 2,730 |
| N. V. De BPM (Shell) | Tandjung | Kalimantan | 1938 | 11,185 | 2 | 2 | 0 | 0 | 0 | 0** | 72,090 | 198 | 110 |
| N. V. De BPM (Shell) | Tarakan | Kalimantan | 1906 | 0 | 0 | 0 | 0 | 0 | 0 | 403 | 1,297,520 | 3,555 | 3,620 |
| N. V. De BPM (Shell) | Babat | South Sumatra | 1901 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 13,820 | 38 | 40 |
| N. V. N. I. A. M. | Badjubang | South Sumatra | 1927 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 872,190 | 2,390 | 1,800 |
| N. V. De BPM (Shell) | Gunung Kemala | South Sumatra | 1938 | 15,941 | 2 | 2 | 0 | 0 | 1 | 16 | 1,270,350 | 3,480 | 3,130 |
| N. V. N. I. A. M. | Kenali Asam | South Sumatra | 1931 | 20,395 | 6 | 6 | 0 | 0 | 1 | 91 | 3,099,420 | 8,492 | 7,420 |
| N. V. De BPM (Shell) | Limau | South Sumatra | 1928 | 185,559 | 32 | 30 | 0 | 2 | 2 | 72 | 7,413,280 | 20,310 | 20,420 |
| N. V. De BPM (Shell) | Mangundjaja | South Sumatra | 1935 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 560,540 | 1,536 | 1,370 |
| N. V. N. I. A. M. | Meruo Senami | South Sumatra | 1938 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 86,090 | 236 | 170 |
| N. V. De BPM (Shell) | Prabumulih West | South Sumatra | 1953 | 5,678 | 0 | 0 | 0 | 0 | 0 | 16 | 1,327,410 | 3,637 | 3,150 |
| N. V. De BPM (Shell) | Sei Taham | South Sumatra | 1903 | 0 | 0 | 0 | 0 | 0 | 0 | 91 | 11,100 | 30 | 60 |
| N. V. N. I. A. M. | Setiti | South Sumatra | 1936 | 16,230 | 7 | 6 | 0 | 1 | 0 | 10 | 457,590 | 1,254 | 1,570 |
| N. V. De BPM (Shell) | Suban Djerigi | South Sumatra | 1905 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 246,750 | 676 | 610 |
| N. V. De BPM (Shell) | Talang Djimar | South Sumatra | 1937 | 21,065 | 2 | 2 | 0 | 0 | 0 | 96 | 6,832,410 | 18,719 | 18,980 |
| N. V. De BPM (Shell) | Tandjung Tiga | South Sumatra | 1940 | 38,465 | 6 | 6 | 0 | 0 | 0 | 27 | 2,379,920 | 6,520 | 7,200 |
| N. V. N. I. A. M. | Tempino | South Sumatra | 1931 | 29,120 | 14 | 14 | 0 | 0 | 0 | 104 | 3,323,340 | 9,105 | 9,930 |
| Total | ..... | ..... | .... | 359,364 | 75 | 71 | 1 | 3 | 4 | 1,470 | 37,563,160 | 102,913 | 99,921 |

* Includes three gas wells. † Includes five gas wells. ** Field shut in awaiting pipe line outlet. Production for local use.

**Standard-Vacuum Petroleum Mij.** Stanvac continued drilling, producing and refining operations in Indonesia during 1957 and 1958. Crude oil production in 1957 amounted to 22,827,066 barrels, or an average of 62,540 barrels daily, as depletion of reserves continued. Stanvac expected to raise its production by about 15,000 barrels daily in 1958 because Lirik field now is on production, but otherwise was not optimistic about expansion unless it can acquire new concessions.

Stanvac had 893 wells capable of crude oil production in Indonesia at the end of 1957, including 561 on production and 332 shut in. Of the producers, 246 were flowing, 314 were on gas lift and 1 was pumping. The company had no gas wells.

Stanvac completed 30 wells during 1957, including 23 development wells on seven wildcats. One wildcat was being drilled at the end of the year. Of the development wells completed last year, 21 were oil wells and two were dry holes. Of the exploratory wells, six were dry and one resulted as an oil producer in South Sumatra. Stanvac drilled a total of 68,013 feet of hole last year, including 43,638 feet in development wells and 24,375 feet in exploratory wells.

**Pipe Line.** Stanvac's unique 8-inch, 90-mile crude oil pipe line from Lirik field to the Buatan terminal on the Siak River went on stream in December, 1957. The line incorporates arctic pipelining techniques (at the Equator) because Lirik crude contains about 25 percent paraffin and has a pour point of 105 to 110. Four heater-pump stations along the line, spaced at 18-mile intervals, keep the crude moving at temperatures up to 153° F. to keep it from congealing in the line before it reaches the next station. The crude is loaded at Buatan into river tankers specially equipped with heating coils, and moved to the Sungei Gerong refinery in South Sumatra.

**Oil Operations by Indonesian Government.** Production on the old Shell North Sumatra concessions was believed to be limited more by transportation and marketing facilities than by productibility of the wells, which were capable of yielding about 30,000 barrels daily prior to World War II. As early as February, 1956, the Indonesian government claimed to be producing about 7,000 barrels daily, but private sources indicated these figures to be exaggerated. However, 1957 crude oil production is estimated at a minimum of 500 barrels per day, and 1958 production was expected to be substantially greater.

The newly-formed Indonesian National Oil Wells Ltd. was reported to have shipped its first tanker-load of oil late in May, 1958, in a Japanese ship. This shipment was also said to be separate from the deal between Edgington oil refinery of Long Beach, Calif., and the Indonesian government. Edgington agreed early in 1958 to finance rehabilitation of North Sumatra fields and to take crude oil production therefrom.

**Proposed Legislation.** By midyear 1958, the Indonesian government had made a long-awaited effort to enact new petroleum legislation. However, the law-making process apparently was to take considerable time. It was expected that greater governmental participation in the oil industry would result from new legislation, when and if adopted.

## British Borneo

SIGNIFICANT changes occurred in the exploration pattern in British Borneo during 1957 and 1958. Oil activity in northwest Borneo is confined to Sarawak, Brunei, North Borneo and areas offshore since the region is politically separate from Kalimantan, the Indonesian (and far larger) portion of Borneo. All operations are conducted by members of the Royal Dutch Shell group. Brunei Shell Petroleum Company Ltd. operates Seria and Jerudong fields in Brunei. Sarawak Oilfields Ltd. operates Miri field in Sarawak. Shell Company of North Borneo, Ltd., is searching for oil in North Borneo, another British dependency separate from Brunei and Sarawak to the southeast, but the company had not yet established production.

**Seria field.** Production from Seria field amounted to 41,371,730 barrels during 1957, for a daily average of 113,347 barrels, a slight drop from the 114,737 barrels daily rate during 1956. Daily production at Seria during December, 1957, was 110,801 barrels.

Miri field produced 474,509 barrels, or 1,300 barrels per day in 1957, as compared to 1,390 barrels daily in 1956.

However, Jerudong field, located between Tutong and Brunei town, a 1955 discovery, was placed on production in 1957 and yielded 191,504 barrels, or 525 barrels per day. Two flowing wells were producing at the rate of 626 barrels daily from the combined interval 3,523-4,021 feet in December, 1957. Total crude production from British Borneo during 1957 amounted to 42,037,743 barrels, or 115,172 barrels daily, as compared with 116,127 barrels per day in 1956.

**Drilling.** At Seria, 18 oil wells were completed during the year, and 135,163 feet of hole was drilled. A deep test, Seria 462 was completed, resulting in an increase in the maximum depth of pay zones listed. At the end of 1956, the deepest pay zone listed at Seria was at 7,300 feet, and the highest oil gravity, 38.

By the end of 1957, the depth was increased to 8,994 feet, and the oil gravity range increased to 50. Including 8,286 feet of hole drilled at Jerudong and 17,083 feet drilled in offshore wildcats during 1957, the operating companies drilled 160,532 feet in British Borneo during the year, compared to 230,863 feet reported for 1956.

Sarawak Oilfields Ltd. dropped 36,650 square miles of oil leases, mainly in the interior at the end of 1957. Since 1946 the company had drilled 17 deep tests, some in remote localities, all of them dry except for those at Suai, near the coast, where

**Drilling and Production in Indonesia in 1957**

| Name of Company | Crude Oil Production in 1957, in Barrels | 1957 Crude Production, in Barrels Daily | Number of Wells Completed in 1957 | | | | Footage Drilled in 1957 | Number of Wells on Production At The End of 1957 |
|---|---|---|---|---|---|---|---|---|
| | | | Oil | Gas | Dry | Total | | |
| Caltex Pacific Oil Company | 53,710,495 | 147,152 | ** | ** | ** | 52 | 45,000* | 152 |
| Royal Dutch Shell | 37,563,160 | 102,913 | 71 | 1 | 3 | 75 | 359,364 | 1,470 |
| Standard-Vacuum Petroleum Mij. | 22,827,066 | 62,540 | 22 | 0 | 8 | 30 | 68,013 | 561 |
| Indonesian National Oil Wells Ltd. | 182,500* | 500* | ** | ** | ** | ** | ** | ** |
| Total | 114,283,221 | 313,105 | ** | 1 | ** | 157 | 472,377 | 2,183*** |

* Figure estimated. ** Figures not available. *** Minimum figure.

small shows of oil and gas were found. The company retains 10,850 square miles in the coastal region.

**Exploration.** Shell Company of North Borneo received the government's assurance of a 9,000-square-mile concession on the continental shelf and territorial waters off the west coast of north Borneo, and exploration was in progress.

Following reflection seismograph and gravity surveys conducted in 1954-56, Brunei Shell spudded Ampa 1 in November, 1956, about 25 miles offshore in 30 feet of water. The well was drilled in seven months to total depth of 5,985 feet and abandoned, having encountered a thick section of heaving plastic clay. It was clear that difficult drilling and rapid facies changes could be expected in the younger Tertiary beds of northwest Borneo.

Sarawak Oilfields Ltd. drilled two holes during 1957 at Siwa, about 15 miles southwest of Miri field in 70 feet of water. The first test was drilled vertically to 7,680 feet, and the second well was deviated at an angle of 30 degrees west and abandoned also as dry at 5,036 feet.

The third prospect to be tested in the South China Sea off Borneo was at Hankin shoals, about 30 miles north of Laubuan Island on a coral reef in 30 feet of water. It was to be spudded from a fixed platform. The three platforms and wells drilled therefrom had cost Shell about $3 million.

**Refining.** The Lutong refinery, operated by Sarawak Oilfields Ltd. at Miri, with a capacity of 50,000 barrels daily, was running 46,400 barrels of crude oil and 2,000 barrels of other feedstocks as of December, 1957. Miri field's crude output, and much of Seria's, is charged to stills at the Lutong refinery.

**PRODUCTION AND DRILLING IN BRITISH BORNEO In 1957**

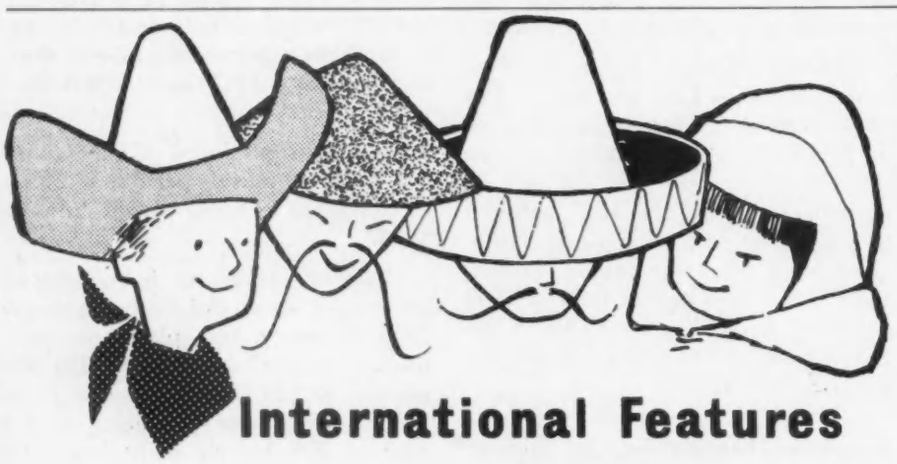
| FIELD | Production (In Barrels) | Wells Completed | | | |
|---|---|---|---|---|---|
| | | Oil | Gas | Dry | Total |
| Seria | 41,371,730 | 18 | 0 | 0 | 18 |
| Jerudong | 191,504 | 1 | 0 | 1 | 2 |
| Miri | 474,509 | 0 | 0 | 0 | 0 |
| Total | 42,037,743 | 19 | 0 | 1 | 20 |

## Papua

STANDARD-VACUUM and The British Petroleum Company interests continued exploration in Papua in 1957 and 1958, a search which if continued would be 40 years old in 1959. During 1957, Australasian Petroleum Company Pty. Ltd. and Island Exploration Company Pty. Ltd. completed four dry holes to an average depth of 5,824 feet.

During the first half of 1958, an additional dry hole was finished, and three more wildcats were being drilled. At Barikewa, the well had reached 13,046 feet on June 10, 1958; Puri 1 had reached 8,021 feet; and Kuru 3 had been drilled to 3,194 feet, with 18⅜-inch casing cemented to 581 feet.

In February, 1958, Oil Search Ltd. indicated that it would withdraw from its 10.22 percent participation interest in the Papuan venture if the three wildcats then being drilled did not give definite encouragement toward finding commercial production. Vacuum Oil Property Ltd., a major interest holder in the venture and an

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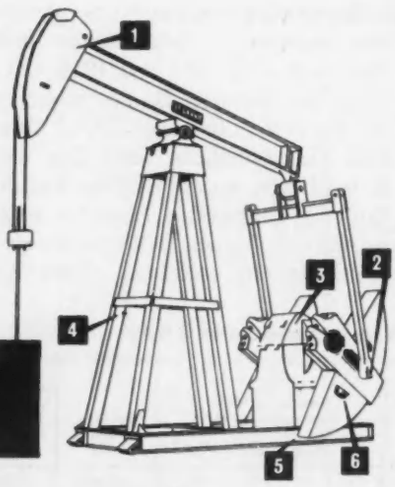


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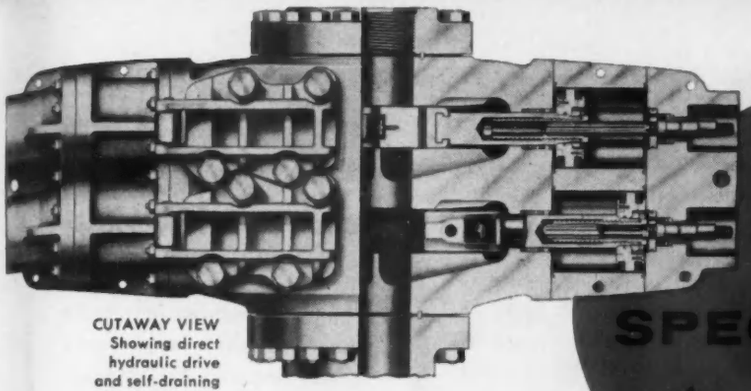

CUTAWAY VIEW
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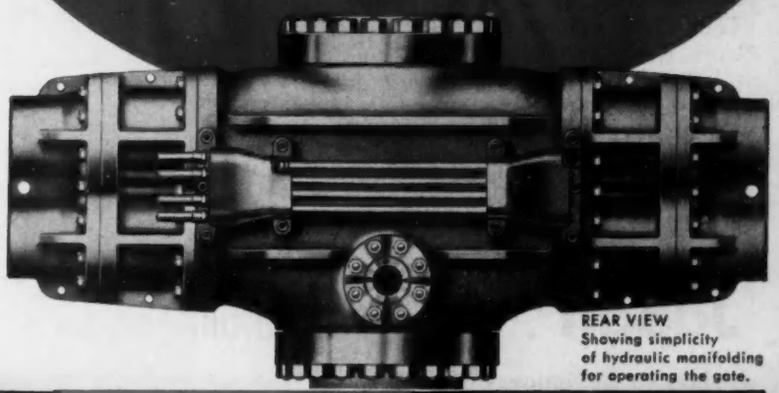

REAR VIEW
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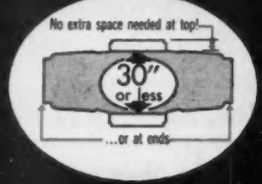


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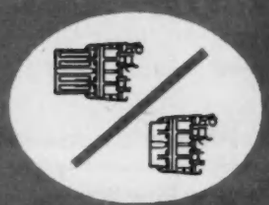

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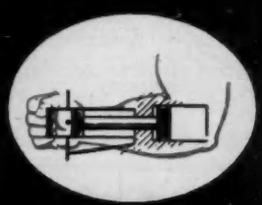

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Australian affiliate of Socony Mobil Oil Company, may do likewise.

Papuan Apinaipi Petroleum Company, composed of Australian interests, was reported planning to drill in an area located east of current Australasian Petroleum Company activities.

### West New Guinea

EXPLORATORY activities continued in 1957 in West New Guinea, conducted mostly in the Digoel block of southeastern West New Guinea. There, nine months of marine seismic work was completed, in addition to land seismic and gravity meter surveys. Production from the three fields —Klamano, Wasian and Mogoi was being depleted rapidly.

Only one well was reported drilled in West New Guinea during 1957—a test in Wasian field that was dry at total depth of 3,083 feet. Royal Dutch Shell, Standard-Vacuum Oil Company and Far Pacific Investments Inc. (Caltex interests) comprise the operating company, N. V. Nederland Nieuw Guinee Petroleum Mij (NNGPM). Royal Dutch Shell is the operator.

Total crude oil production in West New Guinea was 2,294,443 barrels in 1957, an average of 6,286 barrels daily. This was a 12 percent decline from the 7,154 barrels daily rate of 1956. Klamano field produced 75 percent of the yield last year.

**Production In West Guinea In 1957**

| | Annual Production (Thousands of Barrels) | Daily Average Production (Actual Barrels) |
|---|---|---|
| 1957 | 2,294 | 6,286 |
| 1956 | 2,618 | 7,154 |

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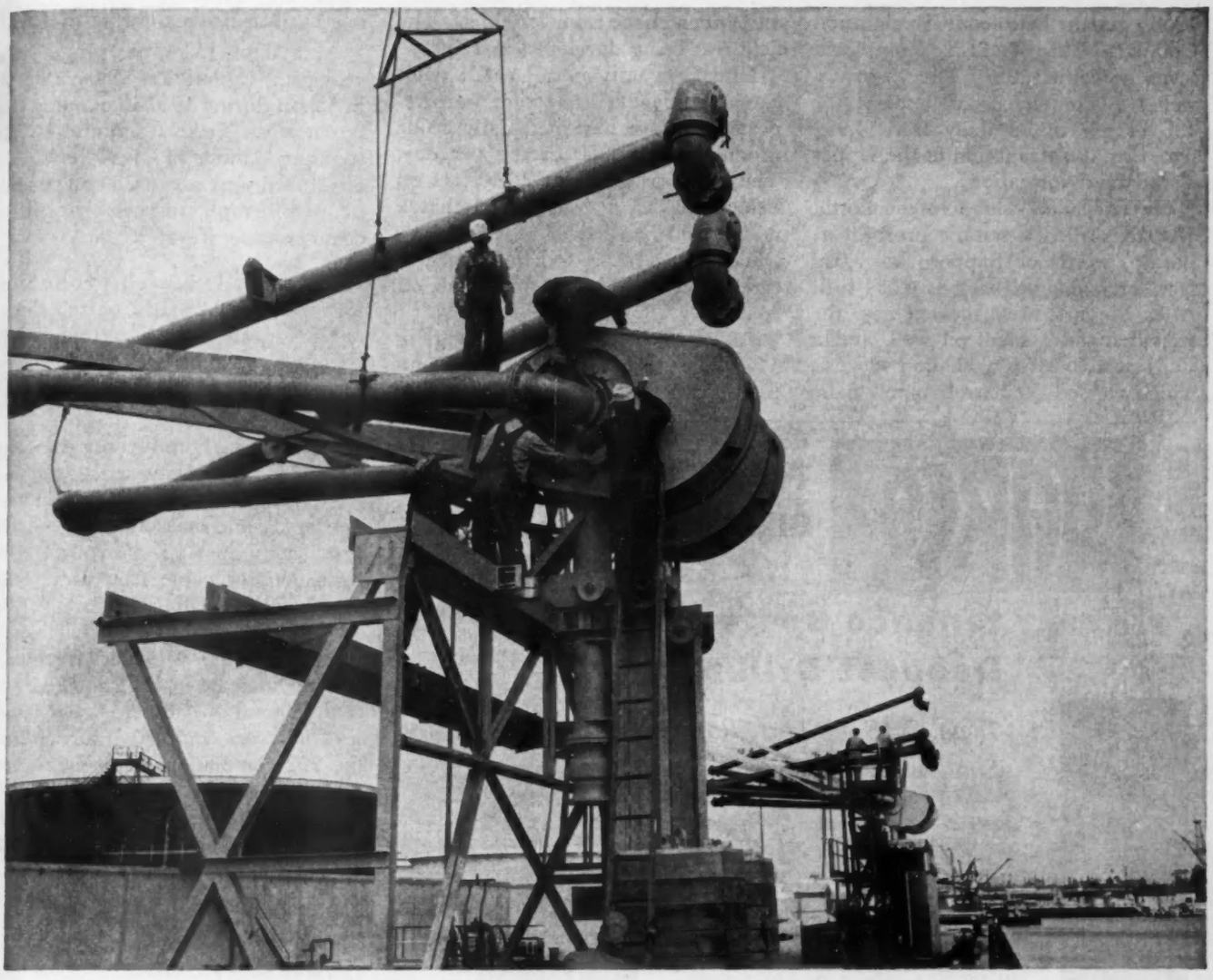
# Japan . . . Offshore drilling begins as industry operations are accelerated

JAPAN'S OIL industry enjoyed a vigorous expansion of almost all phases of activity in 1957 and 1958. While slump was evident in many industries, paralleling the U. S. recession, the oil industry, with increased drilling, production and exploration, was not hard hit. Offshore drilling began in Japan in 1958. Hydraulic fracturing became increasingly important as a stimulant to oil production. Teikoku Oil Company began an experimental in situ combustion project in Niitsu field. Refining capacity was being steadily increased, and the new petrochemicals industry was booming.

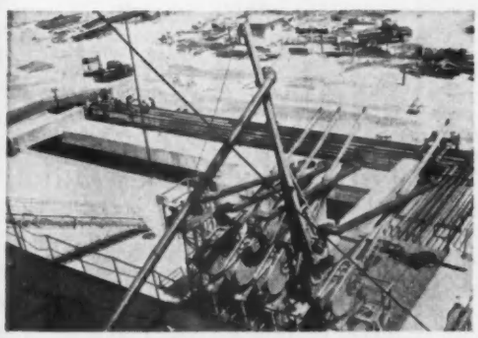
**Exploration.** Of 34 new field wildcats drilled, five oil producers and two gas wells were completed during 1957. At Tamugiyama, in southern Niigata Prefecture, where oil was found in

**Production and Drilling in Japan in 1957**

| COMPANY | Crude Production During 1957 by Company (Barrels) | Natural Gas Production During 1957 by Company (Cubic Feet) | No. of Crude Producing Wells at End of 1957 by Company | No. of Natural Gas Producing Wells at End of 1957 by Company | No. of Wells Shut in as of December 31, 1957 | Amount of Footage Drilled During 1957 (In Feet) | Number of Field Wells Completed During 1957 and Results | | | | Number of Wildcat Wells Drilled During 1957 and Results | | | | No. of Wells Drilling at Dec. 31, 1957 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Oil | Gas | Dry | Total | Oil | Gas | Dry | Total | |
| **Teikoku Oil Co.** | 2,134,262 | 3,723,268,569 | 2,449 | 101 | 778 | 474,110 | 92 | 44 | 21 | 157 | 0 | 2 | 5 | 7 | 25 |
| Hokkaido | 10,320 | 34,555,920 | 89 | 2 | 13 | 3,724 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Akita | 1,751,093 | 1,473,076,258 | 1,315 | 0 | 394 | 262,394 | 66 | 0 | 20 | 86 | 0 | 0 | 0 | 0 | 11 |
| Yamagata | 66,569 | 7,532,894 | 36 | 0 | 10 | 352 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Niigata | 306,280 | 2,208,103,497 | 1,009 | 99 | 360 | 192,036 | 26 | 44 | 0 | 70 | 0 | 0 | 1 | 1 | 13 |
| Kanagawa | 0 | 0 | 0 | 0 | 1 | 11,793 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 1 |
| Toyama | 0 | 0 | 0 | 0 | 0 | 1,936 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Shiga | 0 | 0 | 0 | 0 | 0 | 1,575 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 |
| **Daido Oil Co.** | 5,508 | 0 | 16 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Akita | 3,381 | 0 | 7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 2,127 | 0 | 9 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nihon Kogyo** | 1,723 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Akita | 1,723 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nihon Gas Co.** | 0 | 1,159,055,432 | 0 | 38 | 35 | 2,704 | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 1,159,055,432 | 0 | 38 | 35 | 2,704 | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 |
| **Japan Petr. Expl. Co., Ltd.** | 4,106 | 0 | 2 | 0 | 10 | 167,171 | 6 | 0 | 3 | 9 | 5 | 0 | 22 | 27 | 9 |
| Hokkaido | 519 | 0 | 0 | 0 | 6 | 41,779 | 4 | 0 | 1 | 5 | 1 | 0 | 4 | 5 | 2 |
| Akita | 0 | 0 | 0 | 0 | 0 | 55,803 | 0 | 0 | 0 | 0 | 3 | 0 | 11 | 14 | 3 |
| Yamagata | 0 | 0 | 0 | 0 | 0 | 21,135 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 |
| Niigata | 3,587 | 0 | 0 | 0 | 4 | 48,454 | 2 | 0 | 2 | 4 | 1 | 0 | 4 | 5 | 3 |
| **Niigata Kotsu Co.** | 0 | 230,627,046 | 0 | 15 | 0 | 6,305 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 230,627,045 | 0 | 15 | 0 | 6,305 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| **Nihon Sakusen Co.** | 0 | 746,555,649 | 0 | 36 | 6 | 0 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 746,555,649 | 0 | 36 | 6 | 0 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| **Hokuriku Gas Co.** | 0 | 284,077,902 | 0 | 12 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 284,077,902 | 0 | 12 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nihon Light Metal Co.** | 0 | 388,491,899 | 0 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 388,491,899 | 0 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Kyoei Kogyo Co.** | 0 | 106,174,158 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 106,174,158 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nitto Boseki Co.** | 0 | 82,468,534 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Niigata | 0 | 82,468,534 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Kanto Gas Co.** | 0 | 415,350,359 | 0 | 30 | 82 | 272,500 | 0 | 44 | 0 | 44 | 0 | 0 | 0 | 0 | 44 |
| Chiba | 0 | 415,350,359 | 0 | 30 | 82 | 272,500 | 0 | 44 | 0 | 44 | 0 | 0 | 0 | 0 | 44 |
| **Nihon Natural Gas Co.** | 0 | 670,760,129 | 0 | 31 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chiba | 0 | 670,760,129 | 0 | 31 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Koto Natural Gas Co.** | 0 | 196,455,491 | 0 | 23 | 4 | 23,210 | 0 | 11 | 0 | 11 | 0 | 0 | 0 | 0 | 0 |
| Tokyo | 0 | 196,455,491 | 0 | 23 | 4 | 23,210 | 0 | 11 | 0 | 11 | 0 | 0 | 0 | 0 | 0 |
| **Tohoku Sekiyu Co.** | 37,244 | 0 | 174 | 0 | 98 | 5,353 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Akita | 37,244 | 0 | 174 | 0 | 98 | 5,353 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| **Others** | 60,209 | 600,671,446 | 670 | 558 | 263 | 182,411 | 0 | 21 | 0 | 21 | 0 | 0 | 0 | 0 | 0 |
| Total | 2,243,052 | 8,603,956,613 | 3,315 | 870 | 1,287 | 1,133,764 | 99 | 135 | 24 | 258 | 5 | 2 | 27 | 34 | 78 |



# RICHFIELD INSTALLS NUMBER FOUR



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#58-33

1956, Japan Petroleum Exploration Company Ltd. (JAPEX) completed seven wells in 1957. The discovery well was completed in January, for 196 barrels of oil daily from 4,931 feet. Gas also was found in the Upper Teradomari formation.

On Hokkaido Island to the north, JAPEX drilled a seismic prospect at Barato, north of Sapporo to 7,098 feet, later plugged back to 4,034 feet. After the first well showed gas, the second made a small oil well, and a third test located a shallow deposit which yielded 50 barrels of oil daily on ⅛-inch choke from 1,200 feet. The field was being developed in 1958.

Drill stem tests on a JAPEX wildcat in Yamagata Prefecture were reported to have indicated daily crude production of 1,800 barrels per day. The well was tested at 2,740 feet on Feb. 13, 1958. It was hoped that a major field had been found.

The first offshore test in Japan was expected to spud in October, 1958, off Akita in the Japan Sea.

In other exploratory drilling in 1957, Teikoku Oil Company completed two wildcat tests as gas wells, one each in Kanagawa and Shiga.

A total of 152.4 party months of geological exploration was conducted in Japan during 1957 in about 90 different areas. Teikoku Oil and JAPEX sponsored most of this work. Also conducted were about 75 crew months of seismograph surveys, including some marine work.

**Production.** Crude oil production amounted to 2,243,052 barrels during 1957, for an average rate of 6,145 barrels daily. This was a 3.7 percent increase over the 5,926 barrel-a-day rate in 1956.

Natural gas production, however, expanded at a faster pace, as wells were being drilled deeper and in more new areas, and markets improved. Gas production in 1957 amounted to 8,603,956,613 cubic feet, an average of 23,572,484 cubic feet daily. The 1956 output was 6,240,933,359 cubic feet or 17,051,730 cubic feet daily, and the increase in 1957 was 38.3 percent. A total of 258 field wells and 34 wildcats were completed during 1957, the 292 completions being more than a twofold increase over the 126 wells completed in 1956. At the end of last year, 78 wells were being drilled. In 1957 a total of 1,133,764 feet of hole was drilled, as compared with 680,449 feet in 1956.

**Oil and Gas reserves.** Proved crude oil reserves in Japan as of Jan. 1, 1958 amounted to 21,500,000 barrels. Natural gas reserves at the same time were 7,060,000 MMcf.

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# New Zealand

## Oil production dwindles

EGMONT OIL Wells, Ltd., of New Plymouth, the only current oil producer in New Zealand, produced 4,886 barrels of crude oil during 1957, equivalent to less than 14 barrels per day and less than the 6,000 barrels reported during 1956. All oil was produced from four wells, which also yielded 6.7 MMcf of natural gas during the year.

In the north near Kaitaia, Hyde Oil (Kaitaia) Ltd. completed a 3,000-foot test last year which was dry. Shell Oil Company, The British Petroleum Company and Todd Oil services Ltd. were arranging for the

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drilling of a well in Taranaki. The test was scheduled to be spudded in late this year or early 1959.

Exploration activies are continuing in the Gisborne and Hawkes Bay districts, by BP, Shell and Todd, and geological studies are under way in the Canterbury Province by Todd Brothers, Ltd.

Currently in effect are 151 licenses covering 24,010 square miles in the districts of North Auckland, Auckland, Taranaki, Marlborough, Canterbury, Otago, Southland, Westland, Nelson, and East Coast, North Island.

## Pakistan . . . 1957 and 1958 wildcatting up

EXPLORATORY activity was intensified during 1957 and 1958 as drilling programs in search of new oil moved into high gear, and more private firms received concessions. Only a small amount of new oil was found, but the extension of transmission and distribution facilities for gas from West Pakistan's Sui field stimulated the economy. An important gas reserve at Sylhet in East Pakistan was developed further, and plans were being made for a pipe line and other facilities to move the gas to markets.

**Crude oil production.** Crude oil production in Pakistan still was confined to the old Potwar Plateau region in the northwest. Production by Attock Oil Company Ltd. was primarily from Dhulian field and amounted to 1,504,853 barrels, an average of 4,123 barrels daily. This was a slight increase for Attock compared with the 1956 rate of 3,903 barrels daily.

Pakistan Petroleum Ltd., an affiliate of the Burmah Oil Company, produced 478,880 barrels from Balkassar field, an average of 1,312 barrels daily. The total, 1,983,733 barrels, or 5,435 barrels daily, represented a 5.9 percent decrease from the 5,777 barrels daily rate in 1956.

**Potwar Plateau exploration.** Exploration continued in the productive region with generally negative results. However, the Karsal extension well west of Balkassar field, being drilled jointly by Attock and Pakistan Petroleum, was completed during 1957, pumping a small yield of 27-gravity crude from an Eocene limestone at 11,796 to 11,893 feet. The well had been drilled to 9,494 feet at the start of 1957 and to 12,751 feet later last year before being plugged back. Another test in the area, projected to 12,000 feet, reached 4,839 feet by the end of 1957.

Attock, and its subsidiary, Pakistan Oilfields Ltd., continued drilling a series of wells.

**Sui gas production.** Raw gas offtake from Sui field amounted to 10,811,210 Mcf during 1957, or 29,620 Mcf daily, a 34.7 percent increase from the 8,025 MMcf offtake in 1956. It was expected to rise further to 12,500 MMcf during 1958.

**Sylhet gas field.** Pakistan Petroleum Ltd. completed Sylhet 3 in East Pakistan last summer as a producer rated at 15 MMcf daily from about 4,000 feet. The field was discovered in 1955 when the first test blew out and caught fire. As of mid-1958, proved reserves at Sylhet were estimated at 280 billion cubic feet. An 8-inch, 145-mile pipe line to Dacca has been proposed. A small diameter, 25-mile pipe line to the Chhatak cement plant,


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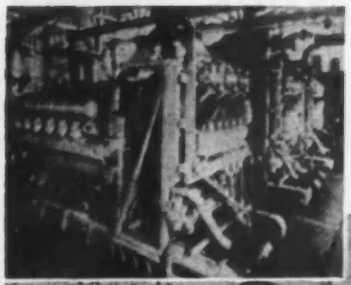
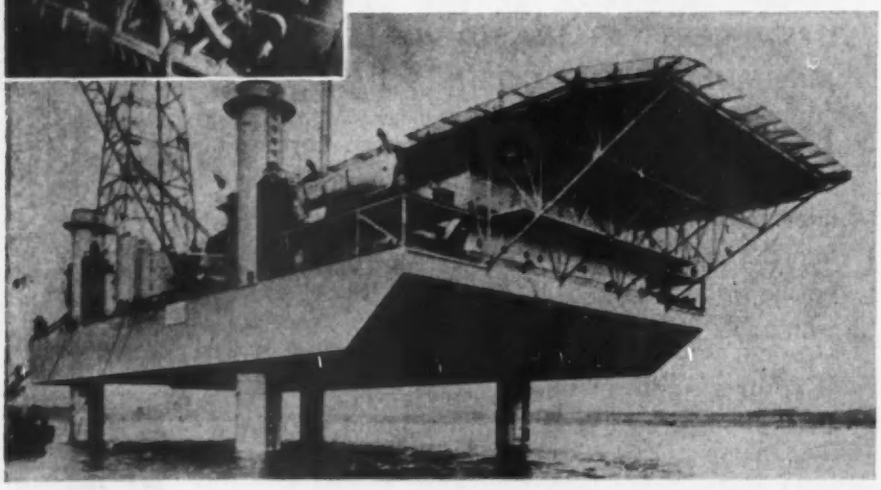


THE ILLUSTRATION BELOW SHOWS THE "ENTERPRISE" DURING THE TESTING OF THE RETRACTABLE LEGS. (B. P. photograph.)



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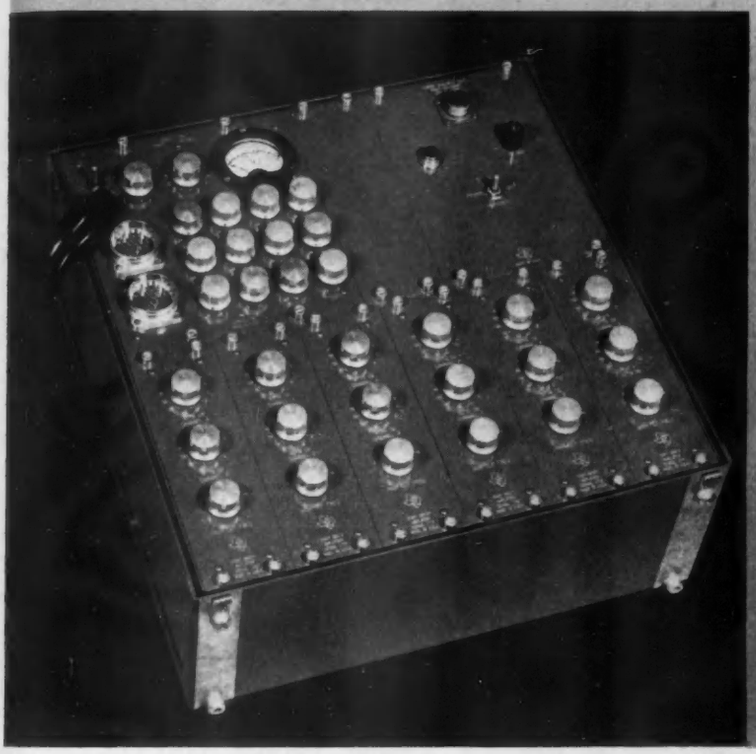

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north of Sylhet, also was being considered.

**Exploration outside Potwar Plateau.** Pakistan Petroleum Ltd. carried out eight party months of reflection seismic work in West Pakistan during 1957. Khairpur 2, located 80 miles south of Sui, was abandoned at 11,670 feet in Jurassic limestone, after minor shows were found in various horizons other than the Eocene limestone that yielded a heavy flow of 87 percent non-combustible gas in 1956. Pakistan Petroleum also spudded Bannh in October, about 110 miles west-northwest of Sui. The well was reported at 7,744 feet in Siwalik beds at the end of the year, and was abandoned as dry in 1958. Karachi 1 was abandoned at 0.958 in Eocene shales after finding minor shows of high pressure gas. A new test at Mazarani, 48 miles from Larkana, was scheduled to be spudded in August, 1958. At Jacobabad, 60 miles south of Sui, a well was being drilled in 1958 to a projected depth of 5,500 feet.

In East Pakistan, PPL spudded Lalmai 1 in September 60 miles southeast of Dacca near the coast and had reached 9,712 feet at the year's end. The well was drilled deeper in 1958 and abandoned as dry. Chhatak 1, near Sylhet, was to be drilled in 1958 if the remote, often-flooded location could be reached with necessary equipment.

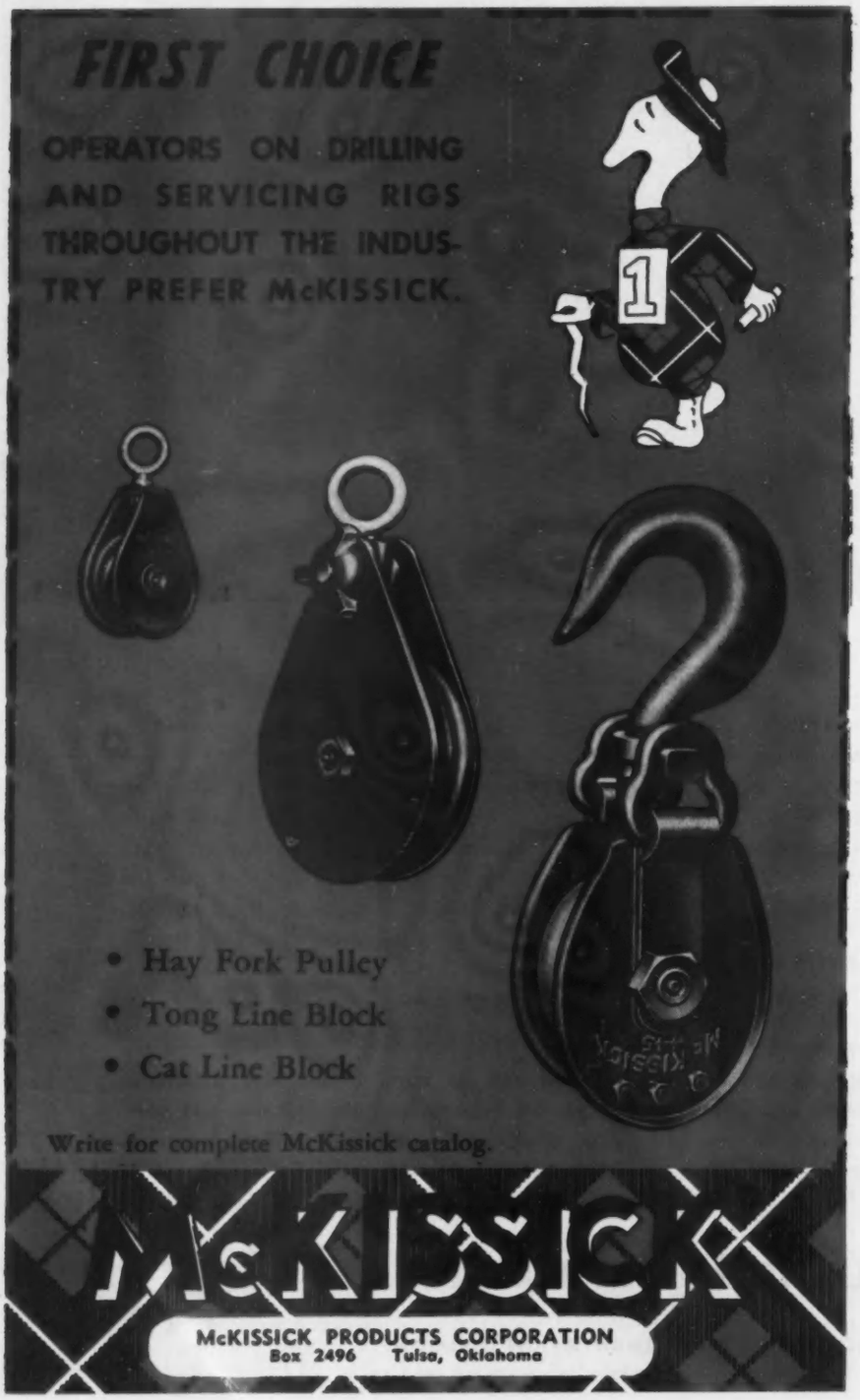
**Hunt interests.** Hunt International Petroleum Company completed a second dry hole, Dhak 2, at 14,614 feet; another at Sari Singh, 40 miles northeast of Karachi, at 10,166 feet. Sunbak 1, located 35 miles east northeast of Sari Singh, had reached 10,000 feet by the end of the year and was reported to have found gas at 10,300 feet. However, discovery reports had not been confirmed by mid-1958. Lakhra 1, northeast of Sunbak, spudded in October, reached 10,454 feet at the year's end, with shows reported.

**Standard-Vacuum Oil Company.** Stanvac drilled three dry holes, Mari 1 and 2 and Talhar 1 all in West Pakistan, in 1957 to an average depth of 10,778 feet. Mirpur Batoro 1 was abandoned early in 1958, and another wildcat was scheduled for 1958 drilling. In 1957, Stanvac operated two geological and three seismograph parties in Pakistan, and added a fourth seismic party in 1958.

**Shell.** Pakistan Shell Oil Company Ltd. had three geological, two gravity and four seismograph parties working on the company's concession areas in Pakistan at the end of 1957. Giandari 1, located in the Sulaiman range about 80 miles north of Kashmor, the first test, was spudded on Feb. 26, 1958, in the Sui field vicinity.

**Sun.** Pakistan Sun Oil Company conducted surface geological, gravimetric, seismic and aerial photographic surveys in its West Pakistan concessions. They are in three tracts aggregating 6.4 million acres.

**Tidewater.** Tidewater Oil Company signed a concession agreement with the Pakistani government in March, 1958, to acquire oil rights on 10,000 square miles in three tracts in West Pakistan. Skelly Oil Company and Kewanee Oil Company are equal partners with Tidewater, with Tidewater as operator.

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# Philippines . . . Exploration widens

PHILIPPINE exploration activity was continuing last year on an increasing scale as local mining companies and newly-organized domestic firms, along with international companies, had joined in leasing almost all prospective areas. Concessions covering most of the Tertiary basin areas have been granted, and an estimated 15 million acres are held by:

San Jose Oil Co., Inc.; Philippines Oil Development Co., Inc.; Acoje Mining Co., Inc.; Topco-Calasiatic Inc.; Standard Vacuum Oil Co.; White Eagle Overseas Oil Co., Inc.; Philex Mining Corp.; Luzon Stevedoring Co., Inc.; Republic Resources and Dev. Corp.; Maremco Mineral Corp.; Royalties, Inc.; Hixbar Mining Co., Inc.; Raymunda Guidote Abila; Baguio Gold Mining Co.; Samar Mining Co., Inc.; Marinduque Iron Mines Agents, Inc.; Madrigal and Company, Inc.; American-Asiatic Oil Corp.; and Mercedes Castro Lazo.

Accelerated exploration has been indicated by:

- A stratigraphic test which was being drilled early in 1958 by Acoje Oil on northern Cebu Island.
- A stratigraphic test under way by Philex on the west coast of Luzon.
- Philippine Oil's Tumauini 2, in the Cagayan Valley, which encountered drilling difficulties and was temporarily abandoned in December, 1957, after reaching a record depth for the Philippines of 13,512 feet.
- Stanvac's test on the Faire anticline, more than 30 miles northwest of Tuguegarao, capital of Cagayan Province, which in October was plugged and abandoned at 10,324 feet due to mechanical and structural difficulties.
- A test being drilled by Acoje Oil Exploration and Drilling Co. in northern Cebu, near Bogo town, which had reached 5,810 feet in March, 1958.
- Stratigraphic test conducted on Sudipen dome in La Union by Philex which had reached 2,120 feet on March 1, 1958.

# Taiwan . . . New formations found on coastal plain called important discovery

PETROLEUM exploration activities in Taiwan during 1957 were conducted in the western foothill regions and the western plains. In an area of about 309 square miles mapped, two structures have been found worthy for exploratory drilling.

**Drilling in 1957.** Eight wells were drilled in 1957, of which five were structural drillings selected in the foothills, and three were stratigraphic tests located on the plains. Among the five structural holes, two were small producers and the others were dry.

An important discovery made by the stratigraphic test wells was the encountering of the Cretaceous and Jurassic formations. They had never before been reported on the coastal

**Oil and Gas Production in Taiwan**

| FIELD | CRUDE OIL PRODUCTION (Barrels) | | NATURAL GAS PRODUCTION (Thousand of Cubic Feet) | | NUMBER OF CRUDE PRODUCING WELLS IN 1957 | | | Number of Natural Gas Producing Wells During 1957 |
|---|---|---|---|---|---|---|---|---|
| | Year 1957 | Daily 1957 | Year 1957 | Year 1956 | Flowing | Artificial Lift | Total | |
| Chuhuangkeng | 11,939 | 33 | 160,042 | 157,795 | .. | 24 | 24 | 1 |
| Chinshui | 2,222 | 6 | 410,042 | 407,749 | 2 | .. | 2 | 10 |
| Chutung | ..... | .. | 179,647 | 170,509 | .. | .. | .. | 6 |
| Shantzechiao | 1,688 | 5 | 1,325 | 1,586 | .. | 2 | 2 | .. |
| Niushan | ..... | .. | 125,866 | 143,196 | .. | .. | .. | 9 |
| Chutouchi | 1,624 | 4 | 228,140 | 172,496 | 4 | 3 | 7 | 1 |
| Liuchunghsi (abandoned in late 1956) | ..... | .. | ..... | ..... | .. | .. | .. | .. |
| Total | 17,473 | 48 | 1,105,062 | 1,053,331 | 6 | 29 | 35 | 27 |



For more data on advertised products, use Readers' Service Cards, last page.

plain and represented entirely new geological information. One of the stratigraphic test wells had an indication of natural gas in limestone formation of the Lower Miocene.

Total footage drilled in 1957 was 33,500 feet.

**Geophysical Work.** Seismic prospecting has been concentrated on the western part of the island. After nine months of surveying with one seismic party in 1957, an additional party has participated in seismic work since September, 1957. A total of 1,763 shot holes were surveyed and located at profiles whose cumulative distance is about 350 miles.

**Refining.** Chinese Petroleum Corporation's Kaohsiung refinery, Free China's only oil refinery, has started shipping petroleum products to Australia. A 10-year contract provides for a first year's shipment of 6 to 7 million gallons, mostly aviation gasoline. Yearly shipments will increase progressively to 15 million gallons in 1959 and perhaps to 50 million gallons yearly beginning in 1966. Capacity of the Kaohsiung refinery is 30,000 barrels of crude oil per day.


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# Thailand . . .

## Rigs from U. S. considered

THAILAND WAS making an effort to alleviate the situation whereby it imports all of its fuel. Two small hydrocarbons deposits in the extreme west and northwest sections of the country along with the Burmese border were to be worked.

At Mae Fang, in the extreme northwestern part of Thailand, about 10 wells had been completed by Jan. 1, 1957, in a small, localized basin of oil-saturated Tertiary gravels overlying crystalline basement rocks. Basement is found in this field at about 650 feet. Only three of the wells were capable of producing as much as 10 barrels daily. A light rig continued work during 1957 at Mae Fang.

A pilot plant has shown that the lightest oil product that can be distilled from the extremely heavy crude produced at Mae Fang is diesel fuel, and the expected volume was much too small to justify installation of cracking facilities. Nevertheless, the government was considering construction of a refinery to charge up to 1,000 barrels daily, and was considering bringing in more rigs from the U. S. to develop the deposit more rapidly. Transportation of the oil to markets also would be a tough problem because Mae Fang is very remote.

A second and somewhat similar project was proposed to develop a 10-square-mile oil shale deposit at Mae Sot, near Tak on the Burmese border. About two-thirds of the workable area is in Thailand, the remainder in Burma. Plans called for joint development by Thai and Japanese interests. A refinery was to be built at Mae Sot to process up to 6,000 barrels of crude daily. Gasoline, fuel oil, propane and coke were to be the principal products, and ammonium sulfate also was to be produced. Here again, transportation of products from this remote area would be a serious problem.

32°
34°
36°
Antalya
T U R
MANY PRIVATE CONCESSIONS
Adana
Mersin
Iskenderun
Aleppo
CYPRUS
S Y
Banias
Homs
Tripoli
T-4
MEDITERRANEAN SEA
Beirut
L E B A N O N
COMPAGNIE LIBANAISE DES PETROLES
has scattered CONCESSIONS
Sidon
Damascus
Haifa
Qaraytain
H-5 Pump Station
Tel Aviv
Jordan River
Jerusalem
Amman
Ashkelon
HELETZ
Garza
BRUR
Port Said
E. W. PAULEY AND PHILLIPS PET. CO.
have concession in Western Jordan
to 33% of Jordan
DEAD SEA
Beersheba
BOTH PRIVATE AND
GOVERNMENT CONCESSIONS
Suez Canal
JORGE ZIMERI has concession rights
to 33% of Jordan
Suez
SUDR
ASL
MATARMA
GULF OF SUEZ
ABU RUDEIS
WADI FEIRAN
RAS GHARIB
BELAYIM
GEMSA
Eilath
Aqaba
GULF OF AQABA
Tabuk
Turaif
30°
28°

38° 40° 42° 44°

Malatya
Batman
Diyarbekir
Mardin
Lake Van
GARZAN
RAMAN
GOVERNMENT RESERVE
MANY PRIVATE CONCESSIONS
MANY PRIVATE CONCESSIONS
MENHALL KARATCHOK
Zammar
AIN ZALAH
BUTMAH
CONCORDIA
SOCIETE DES PETROLES CONCORDIA PERMITS (affiliated with Deutsche Erdol of Germany)
MENHALL
ATLANTIC REFG., AND PORTSMOUTH STEEL have interest in J. W. MENHALL permits
Mosul
Great Zab River
Qawair
Euphrates River
QAIYARAH
KIRKUK
Little Zab River
BAI HASSAN
Sharqat
Kirkuk
K-1 Pump Station
20"
JAMBUR
SOCIETE DES PETROLES CONCORDIA
MOSUL PETROLEUM COMPANY CONCESSION
Iraq Petroleum Company Subsidiary
Al Fat-ha
K-2 Pump Station (Baiji)
IRAQ PETROLEUM COMPANY CONCESSION
British Petroleum Co. 23.75%; Compagnie Francaise des Petroles 23.75%; Royal Dutch Shell 23.75%; Near East Development Co. 23.75%; C. S. Gulbenkian 5%
T-3
T-2 Pump Station
T-1 Pump Station
12" 16" 26" 30" 32"
Haditha
K-3 Pump Station
Khanaqin
Alwand
Tigris River
H-1 Pump Station
KHANAQUIN OIL CO. LTD. CONCESSION
British Petroleum Subsidiary
Diyala River
Baghdad
H-2 Pump Station
Rutba
H-3 Pump Station
H-4 Pump Station
BASRAH PETROLEUM COMPANY CONCESSION
Iraq Petroleum Company Subsidiary
Turaif Pump Station
Jalamid Auxiliary Pump Station
Badanah Pump Station
Uwaigilah Auxiliary Pump Station
El Jauf
Lauga
Rafha Pump Station
30" & 31"
Trans-American Pipe Line Company (Tapline)
Shubah Auxiliary Pump Station
NEUTRA
K E Y
S Y R I A N D E S E R T

46° 48° 50° 52°

U. S. S. R.

Tabriz

Lake Urmia

CASPIAN SEA

Resht

Teheran

Hamadan

ALBORZ

Qum

NATIONAL IRANIAN OIL CO. (GOV'T.)

Kermanshah

Khanaqin

Alwand

Kalentar

KHANAQUIN OIL CO. CONCESSION

NAFT-I-SHAH

KHANAQUIN OIL CO. LTD. CONCESSION
British Petroleum Subsidiary

Z A G R O S M O U N T A I N S

Khurramabad

Azna

Kashan

Isfahan

Dizful

LALI

Lali

SIRIP CONCESSION
(Societe Irano-Italienne des Petroles)
National Iranian Oil Co. 50%; ENI (Italian Gov't.) 50%.

Tembi

MASJID-I-SULAIMAN

SAFID (WHITE OIL SPRINGS)

HAFT KEL

AHWAZ

Karun River

Ahwaz

Kut Abdullah

Lake Dalmaj

Lake Sanniya

Tigris River

Euphrates River

Lake Al Hammar

Kalafabad

AGHA JARI

PAZANUN

GACH SARAN

Mashur

Basra

RUMAILA

ZUBAIR

Abadan

Zuhra River

Mishur

IRANIAN OIL EXPLORATION

British Pet. Co. Ltd., 40%; Royal

RAUDHATAIN

SABRIYA

BAHRA

KUWAIT

Bubiyan Island

Fao

IPAC
(Iran Pan American Oil Co.)
CONCESSION

SIRIP CONCESSION
(Societe Irano-Italienne des Petroles)

IRAN PAN AMERICAN CO. CONCESSION
(IPAC)
Pan American Pet. Corp. (Standard of Indiana) 30%;
National Iranian Oil Co. 50%.

Kuwait

KUWAIT OIL COMPANY CONCESSION
Gulf Oil Corp. 50%; British Pet. Co. 50%.

NEUTRAL ZONE

AHMADI RIDGE

MAGWA

BURGAN

Mina al Ahmadi
Aminoil

Bushire

NEUTRAL ZONE

WAFRA

Mina Saud
Mufatta

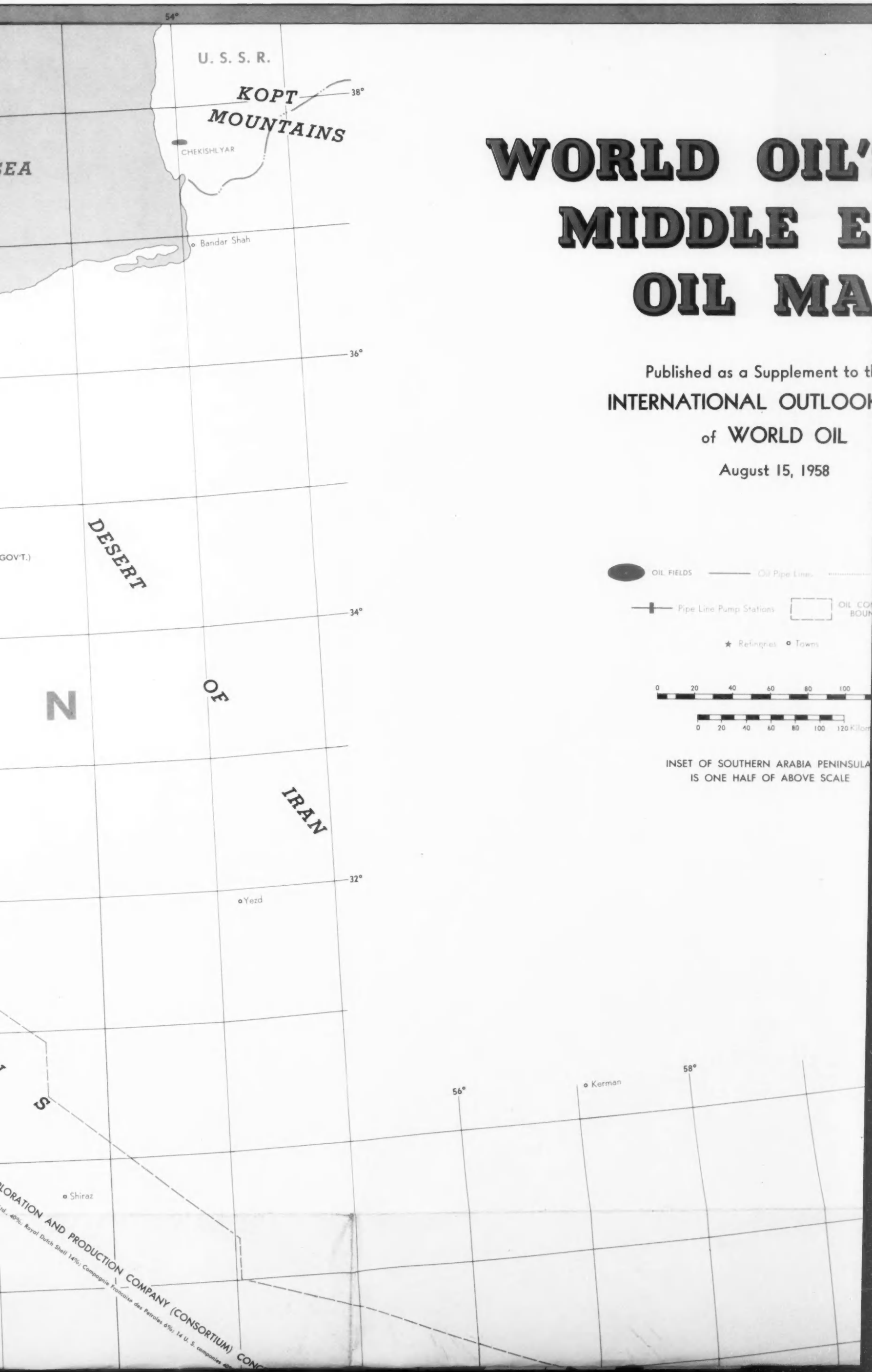
JAPAN PETROLEUM TRADING CO. LTD. CONCESSION

AMERICAN

COMPANY CONCESSION
Compagnie Francaise des Petroles 23.75%;
23.75%; Near East Development Co. 23.75%;
C S Gulbenkian 5%

# WORLD OIL'S
# MIDDLE E
# OIL MA

Published as a Supplement to th
INTERNATIONAL OUTLOOK
of WORLD OIL
August 15, 1958



54°

U. S. S. R.

KOPT MOUNTAINS

38°

CHEKISHLYAR

Bandar Shah

36°

34°

IRAN

32°

Yezd

56°

Kerman

58°

# WORLD
# MIDDL
# OIL

Published as a

INTERNATIONA

of W

Aug

OIL FIELDS

Pipe Line Pump S

★ Re

0 20 40

0 20 40

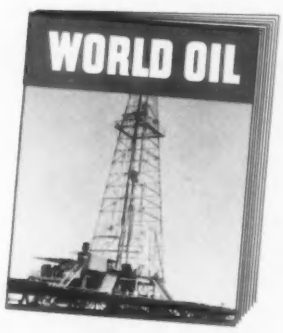
INSET OF SOUTH
IS ONE HAL

MPANY (CONSORTIUM) CONC

Petroleum 40%, 14 U. S. companies 40%

# D OIL'S 1958
# DLE EAST
# L MAP

as a Supplement to the
ONAL OUTLOOK ISSUE
f WORLD OIL
August 15, 1958




Oil Pipe Lines ..... Gas Pipe Lines

Pump Stations OIL CONCESSION BOUNDARY

★ Refineries ○ Towns

40 60 80 100 120 Miles

20 40 60 80 100 120 Kilometers

SOUTHERN ARABIA PENINSULA
NE HALF OF ABOVE SCALE

WADI FEIRAN
RAS GHARIB
BELAYIM
SUEZ
GULF OF
GEMSA
E
HURGHADA
RED SEA
Tabuk
Al 'Ala
Wejh
28°
26°
34°
36°
38°
40°
44°
48°
ARABIAN AMERICAN OIL COMPANY
PREFERENTIAL CONCESSION RIGHTS
Jedda
Mecca
S A U D I A R
Sulaiyl
Bisha
RUB AL KHALI DE
WESTERN BOUNDARY ARABIAN AMERICAN OIL COMPANY CONCESSION
R E D S E A
M O U N T A I N R A N G E
Abha
Farasan Islands
Gizan
Sharora
Tamis
Y E M E N
Zamakh
Tarim
Shibam
Luhaiya
San'a
YEMEN DEVELOPMENT CORP. CONCESSION
U. S. Interests
Shabwa
Beihan
Nisab
Mukalla
Rujaima
PROTE
BRITISH PETROLEUM EXPLORATION CO. LTD. CONCESSION
A D E N
Ahwar
ERITREA
ETHIOPIA
Mocha
Aden
ADEN
GULF OF
FRENCH SOMALILAND
16°
20°

Trans-American Pipe Line Company (Tapline)

Shubah Auxiliary Pump Station

NEUTR

S A U D

Bashuk

Kagra

Hail

Al' Ala

40°

42°

44°

52°

56°

26°

20°

24°

22°

16°

Raga

Ghaba

Auda

A B I A

DESERT (Empty Quarter)

O M A N

PETROLEUM DEVELOPMENT (OMAN) LTD. CONCESSION
Iraq Petroleum Co. Subsidiary

Khaluf

Masira

Duqm

Gharim

Ghanet

Mugshin

U N D E F I N

Dauka

Shanna

D H O F A R

DHOFAR-CITIES SERVICE CORP. CONCESSION
Cities Service Oil Co. 50%
Richfield Oil Corp. 50%

Mazraq

Marmul

MARMUL

Shuwamiya

A R A B I A N S E A

N D A R Y

Sanau

Habarut

Thamud

Salala

Murbat

Risut

Tamis

T E C T O R A T E

HADHRAMAUT
PETROLEUM CONCESSIONS LTD.
Iraq Petroleum Company Subsidiary

Saihut

Kiyan

M O U N T A I N R A N G E

# SOUTHERN ARABIAN PENINSULA

0 100 200 Miles

0 100 300 Kilometers

KUWAIT

Kuwait

KUWAIT OIL COMPANY CONCESSION
Gulf Oil Corp. 50%; British Pet. Co. 50%.

NEUTRAL ZONE

AHMADI RIDGE

MAGWA

BURGAN

Mina al Ahmadi

Aminoil

Mina Saud

Mufatta

WAFRA

AMERICAN INDEPENDENT OIL CO. (10 U. S. Companies) 50%;
GETTY OIL CO. 50%

JAPAN PETROLEUM TRADING CO. LTD. OFFSHORE CONCESSION

IRAN PAN AMERICAN CO. CONCESSION (IPAC)
Pan American Pet. Corp. (Standard of Indiana) 30%;
National Iranian Oil Co. 30%.

Bushire

Line Company (Tapline)

Auxiliary Pump Station

Qaisumah

Bashuk

Wadiah Pump Station

Nariya Pump Station

ARABIAN AMERICAN OIL COMPANY CONCESSION

Standard Oil Co. of California 30%; The Texas Co. 30%; Standard Oil Co. (New Jersey) 30%; Socony-Vacuum Oil Co. 10%

SAFANIYA

MANIFA

ABU HADRIYA

KHURSANIYAH

Abu Hadriya

Jubail

FADHILA

Turaif Pump Station

Hanadh

Qaiya

QATIF

Ras Tanura

Damman

DAMMAN

Dhahran

BAHRAIN PETROLEUM CO. CONCESSION
Standard Oil Co. of California 50%;
The Texas Co. 50%

Muharraz

BAHRAIN

NORTH AIN DAR

ABQAIQ

AIN DAR AREA

SHEDGUM AREA

GHAWAR

UTHMANIYAH AREA

Hofuf

HUIYA AREA

Selwa

HARADH AREA

Riyadh

Bir Aziz

Jabrin

Auda

ARABIAN AMERICAN OIL COMPANY
PREFERENTIAL CONCESSION RIGHTS

RUB AL KHALI DESERT (E

MOUNTAIN RANGE

ARABIAN PENINSULA

PERSIAN GULF

QATAR PETROLEUM CO. LTD.

DUKHAN

26°

20°

16°

24°

22°

46°

48°

50°

AND PRODUCTION COMPANY (CONSORTIUM) CONCESSION

40%; Royal Dutch Shell 14%; Compagnie Francaise des Petroles 6%; 14 U. S. companies 40%.

Lar

Bandar Abbes

Quishm Island

S I A N

G U L F

QATAR

QATAR PETROLEUM CO. LTD. CONCESSION
Iraq Petroleum Co. Subsidiary

SHELL COMPANY OF QATAR, LTD. OFFSHORE CONCESSION

DUKHAN

Doha (Bida)

Umm Said

Selwa

DUBAI MARINE AREAS LTD. CONCESSION
British Pet. Co. and Compagnie Francaise des Petroles

PETROLEUM DEVELOPMENT (TRUCIAL COAST) LTD. CONCESSION

Ajman

Dubai

Juweiza

Fujairah

GULF

ABU DHABI MARINE AREAS, LTD. CONCESSION TO ABU DHABI WATERS
British Petroleum Co. / Compagnie Francaise des Petroles

Abu Dhabi

TRUCIAL COAST

PETROLEUM DEVELOPMENT (TRUCIAL COAST) LTD. CONCESSION
Iraq Petroleum Co. Subsidiary

Burami

Sohar

OMAN

Shuweihat

Murban

BOUNDARY UNDEFINED

PETROLEUM DEVELOPMENT

BOUNDARY UNDEFINED

Ibri

Arrada

Adam

Fahud

Raga

Ghaba

A

(Empty Quarter)

SEE SOUTHERN CONTINUATION AT LEFT

52°

54°

56°

NSORTIUM) CONCESSION
U.S. companies 40%
Lar
Bandar Abbas
Quishm Island
PETROLEUM DEVELOPMENT (TRUCIAL COAST) LTD. CONCESSION
DUBAI MARINE AREAS LTD. CONCESSION
British Pet. Co. and Compagnie Fran-caise des Petroles
Ajman
Dubai
Juwelza
Fujairah
GULF
ABU DHABI MARINE AREAS, LTD. CONCESSION TO ABU DHABI WATERS
British Petroleum Co. / Compagnie Francaise des Petroles
Abu Dhabi
TRUCIAL COAST
PETROLEUM DEVELOPMENT (TRUCIAL COAST) LTD. CONCESSION
Iraq Petroleum Co. Subsidiary
Burami
Sohar
OMAN
Murban
DARY UNDEFINED
UNDEFINED BOUNDARY
Ibri
Arrada
Fahud
Raga
Ghaba
T LEFT
54°
56°

28°
26°
SIRIP CONCESSION
(Societe Irano-Italienne des Petroles)
National Iranian Oil Co. 50%; ENI (Italian Gov't.) 50%.
OF
OMAN
24°
Sib
Muscat
MOUNTAINS
Sur
Dariz
Adam
22°
CONCESSION
PETROLEUM DEVELOPMENT (OMAN) LTD.
Iraq Petroleum Co. Subsidiary
O M A N
K. halut
Masira Island
20°
58°
60°

# WORLD OIL'S 1958 OIL
# OF VENEZUELA, COLO
# AND TRINIDAD

Published as a Supplement to the
INTERNATIONAL OUTLOOK ISSUE
of WORLD OIL, August 15, 1958

OIL FIELDS — Oil Pipe Lines — Gas Pipe Lines

★ Refineries ▲ Gas Injection Plants o Towns

Areas on which concessions have been granted or applied for

0 10 20 40 60 80 100 Miles

0 10 20 40 60 80 100 Kilometers

***Private companies hold all concession areas in Panama.***

78° 76° 12° 10° 8°

PANAMA

SAN MIGUEL BAY

GULF OF DARIEN

Turbo

CARIBBEAN

Cartagena

Mamonal

Coveñas

Sincelejo

Lorica

CHINU

Chiná

BOL

Montería

SINU (Abd.

JOBO TA

San M

San Jorge River

Sinú River

Man River

Cauca River

Esmeralda River

Atrato River

Dabeiba

Murindo

Ituaggo

ANTIO

# L MAP
# OMBIA
# O

74° 72°

SEA
CARIBBEAN
GUAJIRA
Guajira Peninsula
GULF OF VEN
Riohacha
Soldado
Dibulla
Santa Marta
Sinamaica
AMANA
Barrancas
Barranquilla
ATLÁNTICO
San Juan de Cesar
Fundación
Valledupar
Cartagena
Mamonal
Calmar
MAGDALENA
ZULIA
San Rafael
MARA
NETIK
LA PAZ
Palmarejo
Altagracia
Maracaibo
Sta. Rita
LA CONCEPCION
BOSCAN
ENSENADA
La Concepcion
CABIMAS
LA SALINA
Cabimas
QUIROZ
TOTUMO
MACOA
SAN JOSE
URDANETA
TIA JUANA
LAGUNILLAS
PUEBLO VIEJO
BACHAQUERO
MENE GRANDE
MOTATAN
San Lorenzo
LAKE MARACAIBO
Venados
Machiques
ALTURITAS
EL DEFIGH
Plato
El Carmen
El Paso
Sagua
Ovejas
Magangué
CICUCO
El Banco
Chiná
ZULIA BASIN
CARIBBEAN BASIN
RIO DE ORO
Betijoque
Esauque
Bobures
Toronday
San Carlos
LOS MANUELES
EL CUBO
TARRA
TARRA W
TIBU
SARDIMATA
PETROLEA
CARBONERA
Mucuchies
Merida
Ejido
Laguinillas
Balladores
La Grita
San Juan de Colón
Pregonero
Labatera
Independencia
San Antonio
Tariba
San Cristobal
Rubio
TACHIRA
MERIDA
BARINAS
JOBO TABLON
Mamon
San Marcus
Majagual
La Gloria
El Carmen
Convención
BUTURAMA
Ocaña
TOTUMAL
NORTE SANTANDER
MAGDALENA RIVER BASIN
CARIBBEAN BASIN
Zaragaza
CANTAGALLO
Pto. Wilches
Cachiri
SOGAMOSA
LA SALINA (Abd.)
GALAN
QUEBRADA ROJA
Barrancabermeja
Bucaramanga
LA CIRA
INFANTAS
SAN LUIS (Abd.)
Piedecuesta
LA MUGROSA (Abd.)
Málaga
QUIA
DER
Suripa
Sarare
Uribante
Caparo
Nechi
Tigui
Ite
Cesar River
Magdalena River
Zulia River
Tachira River
Nuevo River
Tarra River
Catatumbo
Escalante
Chama River
Mucujepe River
Motatan River
Pueblo Viejo
Tamare River
Palmar River
Apon River
Yara River
Negro River
Tacarigua River
Sta. Ana River
Arigua River
Aricuani River
Cauca
Sogamoso River
Suarez River
Fundacheo River
Guasare River
Socuy River
Cachiri River
Palmar River
Fundacionera River
Uribante River
Mutatuy River
Pedregal R.
Socopo
Pumar River
Tucani River
Matatan
Chama River
Mucuchies River
Bombo
Motatan
Pedregal
Caparo
Capan
Uribante River
Sarare River
Suripa River
Nechi River
Tigui River
Ite River
Magdalena River
Cesar River
Cauca River
Nuevo River
Zulia River
Tachira River
Tarra River
Escalante
Catatumbo
Chama River
Mucujepe River
Motatan River
Pueblo Viejo
Tamare River
Palmar River
Apon River
Yara River
Negro River
Tacarigua River
Sta. Ana River
Arigua River
Aricuani River
Sogamoso River
Suarez River
Fundacheo River
Guasare River
Socuy River
Cachiri River
Palmar River
Fundacionera River
Uribante River
Mutatuy River
Pedregal R.
Socopo
Pumar River
Tucani River
Matatan
Chama River
Mucuchies River
Bombo
Motatan
Pedregal
Caparo
Capan
Uribante River
Sarare River
Suripa River
Nechi River
Tigui River
Ite River
Magdalena River
Cesar River
Cauca River
Nuevo River
Zulia River
Tachira River

70° 68°

ARUBA

CONTINENTAL SHELF

BONAIRE

CURACAO

Guajira Peninsula

Pueblo Nuevo

Paraguana Peninsula

Amuay

El Cardón

Pto. Cumarebo

GULF OF VENEZUELA

Coro

La Vela

CUMAREBO

Cabure

San Luis

San Juan

Sinamaica

EL MAMON

Pedregal

San Rafael

Palmarejo

TIGUAJE

LAS PALMAS

MONTE CLARO

HOMBRE PINTADO

MEDIA

Altagracia

Maracaibo

Sta. Rita

Churuguara

Tucacas

Siquisique

FALCON BASIN

Pto. Cabello

Turiamo

MOUNTAIN

Aroa

San Felipe

Duaca

Guama

Chivacoa

Montalbán

Valencia

Lake Valencia

Guacara

Maracay

Turmero

Urachiche

Yaritagua

Nirgua

Bejume

Barquisimeto

Cabudare

Guigue

Villa de Cura

LAGUNILLAS

PUEBLO VIEJO

BACHAQUERO

San Lorenzo

LAKE MARACAIBO

MOTATAN

MENE GRANDE

Quibor

El Tocuyo

Carora

Carache

Tinaquillo

San Carlos

El Pao

Araure

Acarigua

Betijoque

Trujillo

Escuque

Valera

Boconó

Biscucuy

Ospino

Piritu

Villa Bruzual

Laguinitas

Bobures

La Quebrada

Toronday

Guanare

El Baúl

San Carlos

Barinitas

Mucuchies

Guanarito

Merida

Ejido

Barinas

Obispos

Laguinillas

SILVAN

SILVESTRE

Ciudad Bolivia

Libertad

Arismendi

Balladores

Puerta Nutrias

Pregonero

Bruzual

San Fernando de Apure

Guasdualito

*Forty some private com*
*partnerships, held oil c*
*million acres in Venezu*

66° 64°

TRINIDAD FIELDS

0 4 8 Miles

0 8 Kilometers

SOLDADO

GULF O

Poin

CEDROS (A

CARIBBEAN SEA

Orchila Island

Los Roques Islands

La Blanquilla Island

Los Testigos Islands

CONTINENTAL SHELF

Depth + 600 Feet

Depth – 600 Feet

CARIACO BASIN

Tortuga Island

NUEVO ESPARTA

Margarita Island

Coche Island

vate companies, including joint
eld oil concessions on over 16
Venezuela at the end of 1957.

Maiquetia
La Guaira
Macuto

FEDERAL DISTRICT

IN RANGE

Caracas

Petare

Guarenas

Buatire

Higuerote

Cumana

Carupano

Rio Caribe

Cariaco

El Pilar

San Antonio del Golfo

SUCRE

Los Teques

Sta. Lucia

Caucagua

Rio Chico

Pto de la Cruz

Cumanacoa

Caripe

San Antonio

Cumare del Tuy

MIRANDA

Pto. Piritu

Barcelona

Ciarines

Aragua de Maturin

ARAGUA

OROCUAL

Caicara

QUIAMARE

CARBO PELADO

STA. BARBARA

MURI

JUSEPIN

Maturin

LA VIEJA

LA CEIBA

CAPACHO

TACATA

MULATA

TRAVIESO

MATA GRANDE

TACAT

San Sebastian

San Casimiro

Altagracia de Orituco

San Juan
los Morros

BRUZUAL

PLACER

Barbacoas

El Sombrero

BARBACOAS

DAKOA

Valle de la
Pascua

LECHOSO

LAS MERCEDES

PUNZON

BELEN

GRICO

GUAVINITA

PIRAGUA

PALACIO

ROSITAS

RUIZ

SABANA

BELLA VISTA

TUCUPIDO TAMAN

CASACARONCITO

Aragua de Barcelona

EL ROBLE

GUARIO

SN. JOAQUIN

San Roque

SN. ROQUE

ROBLOTE

LOS OLLAS

APAMATE

EL CHAPARRO

MAHOMA

COPORO

ANIBAL

RETUMBO

SAN FELIX

TOCO

RINCON

CAICO SECO

GUERE

MANTECO

ELIAS

Pariaguan

SOCORORO

YAGURE

ISLA

FRIA

MAPUEY

CM-6

OS-31

OG-202

OFICINA

YOPALES

Oficina

AVENTAZON

AREO MEREY

Guario

STA. ROSA

LA CEIBITA

ARAGUA

SOTO

STA. ANA

MAPIRI

BOCA

CHI MIRE

GUICO

LOS MANGOS

SOTO E.

NIPA

MATA

AGUASAY

ZETA

OSCUROTE

PELAYO

LEONA

GUARA W.

GUARA E.

San Tome

ORITUPANO

PELAS

JUNTA

DACION

LOBO

LEJOS

TEMBLADOR

JOBO

Lake
Guarico

Calabozo

GUARICO

MATURIN BASIN

ANZOATEGUI

Soledad

Ciudad Bolivar

Pto. Ordaz

Moitaco

Mapire

Caicara

BOLIVAR

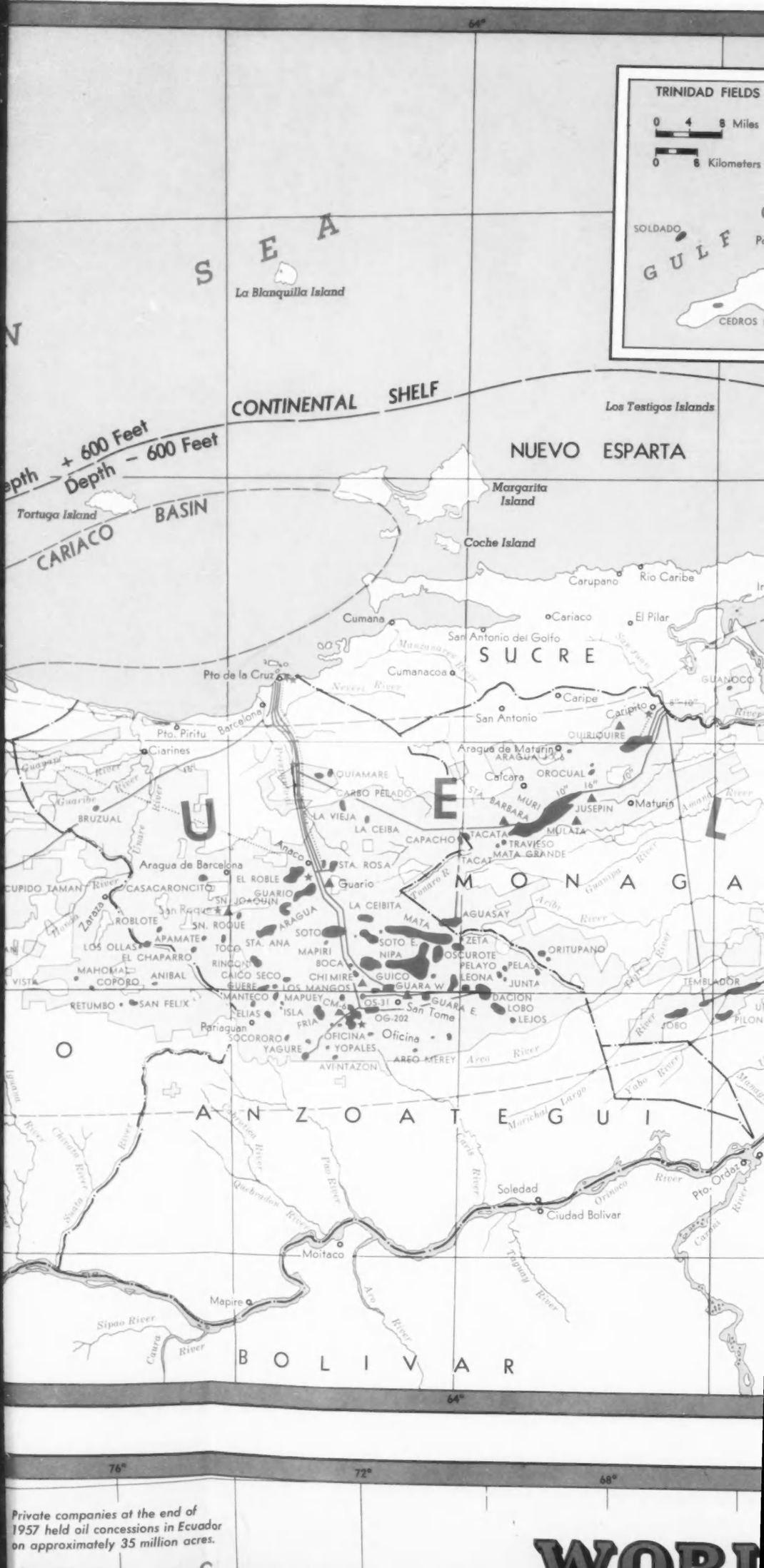
80° 76° 72° 68°

Private companies at the end of
1957 held oil concessions in Ecuador
on approximately 35 million acres.

Esmeraldas

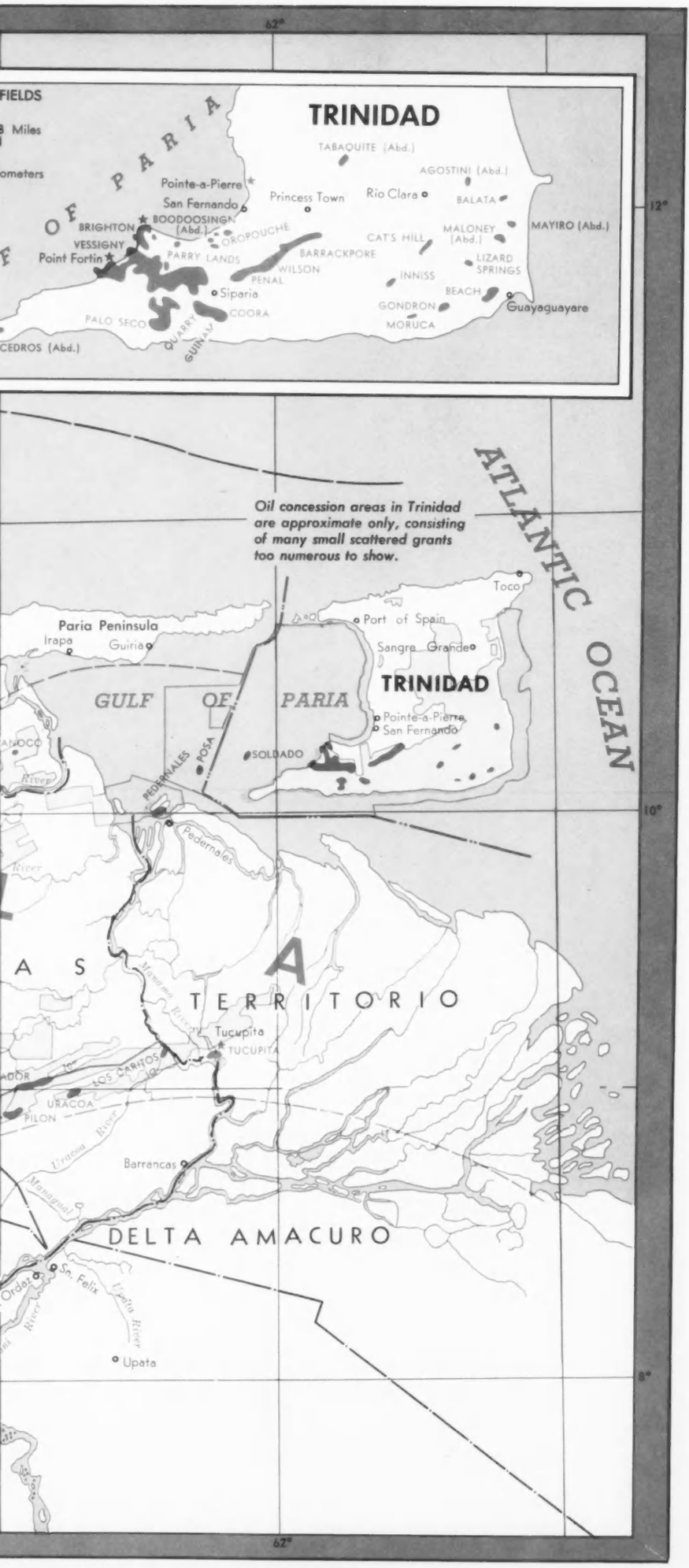
Tulcan

WORL




Private companies at the end of 1957 held oil concessions in Ecuador on approximately 35 million acres.

WORL




RLD OIL'S 1958

At the end of 1957, private companies held oil concessions on approximately 17 million acres in 114 concessions in Colombia. Applications had been made on an additional 51 million acres.
Atrato River
Murindo
Dabeiba
Ituaggo
A N T
Antioqua
Anzá
Medell
MOUNTAINS
Quibdo
C H O C O
C A
ANDES
Istmina
M
Cartogo
PACIFIC BASIN
OF
RANGE
San Juan River
Buenaventura
T
VALLE DEL CAUCA
Barco
Palmira
Cali
WESTERN
Coloto
Santander
MAGDALENA RIVER
C A U C H A
Silvia
Popayan
Dolores
La Sierra
H U
Patia River
La Cruz
N A R I N O
Recodo
Ricaurta
Pasto
Tuguerres
Mocoa
Fragua
Mira River
Cordoba
Tulcan
Putumayo River
P U T U M A Y O
PACIFIC OCEAN
COLOMBIA
ECUADOR
6°
4°
2°
78°
76°

CANTAGALLO
Pto. Wilches
SOGAMOSA
LA SALINA (Abd.)
GALAN
QUEBRADA ROJA
Bucaramanga
Barrancabermeja
LA CIRA
INFANTAS
Piedecuesta
SAN LUIS (Abd.)
LA MUGROSA (Abd.)
Málaga
Santa Rosa
San Gil
Pto. Berrío
Socorro
Alexandria
Cocuy
Medellín
Charalá
CAIPAL
VELASQUEZ-PALAGUA
Jerico
La Dorado
Tunja
Ubate
Manizales
Guatavita
Bogotá
Ibagué
Fusagasuga
Caquez
GULANDAY
Guamo
ORTEGA
TETUAN
Villavicencios
Neiva
Algeciras
Bricene
Florencia
Cocuy Range
Uribante
Sarare
Meta
Muco
Uvaida River
Ariari River
Guayabero River
Yamuara River
Ariari River

T I O Q U I A
S A N T A N D E R
A R A
A L D A
C O L O M
B O Y A C A
C U N D I N A M A R C
T O L I M A
M E T A
C A Q U E T A

MAGDALENA RIVER BASIN
ANDES MOUNTAINS OF
EASTERN RANGE
MAGDALENA RIVER BASIN

Cauca River
Nechi
Ité River
Magdalena
Sogamosa River
Products Pipe Line

74°
72°

Uribante River
Guasdualito
Sarare River
Arauca River
A P U R E
BARINAS
Cunaviche River
Capanaparo River
A R A U C A
Cravo Norte River
Meta River
Arauca River
A C A
M B I A
Meta River
Tame River
Tame River
Negro River
Meta River
Meta River
Yucabalo
V I C H A D A
VENEZUELA
LLANOS BASIN
V A U P E S
B R A Z I L
70°
68°

# WORL
# OIL M
# ECUAD

Published as
INTERNATIONA
of WORLD

*Private companies at the end of 1957 held oil concessions in Ecuador on approximately 35 million acres.*

*Private companies at the end of 1957 held oil concessions in Peru on approximately 35 million acres.*

80° 76° 72° 68°

0° 4° 6° 8° 12° 16° 20° 24°

COLOMBIA

ECUADOR

PERU

BOLIVIA

CHILE

ARGENTINA

PACIFIC OCEAN

BRAZIL

Esmeraldas · Tulcan · Ibarra · Quito · Chone · Manta · Latacunga · Ambato · Catarama · Daule · Guayaquil · Palmira · Chanduy · Cuenca · Tumbes · Loja · Talara · Sullana · Huaca · Chulucanas · Piura · Bellavista · Bagu · Moyabamba · Cutervo · San Martin · Chiclayo · Bolivar · Truijillo · Cabana · Tayabama · Caras · Casma · Huaras · Llata · Aija · Huanco · Ambo · Cajatambo · Cerro de Pasco · Huacho · Canta · Callao · Lima · Huancayo · Huancavelia · Pisco · Huaitara · Ica · Puquio · Yauri · Chivay · Puno · Aplao · Camana · Arequipa · Mollendo · La Paz · Viacha · Sica Sica · Oruro · Tacna · Arica · Iquique · Antofagasta · Iquitos · Nauta · Barja · Requena · Maquia · Contamana · Ucalpa · Aqua Caliente · Puerto Pardo · Cobija · Quillabamba · Puerto Madonado · Lake Titicaca · Lake Poopo · Rio Mul

Napo River · Putumayo River · Amazon River · Pastaza River · Maranon River · Ucayali River · Yavari River · Yurua River · Huallaga River · Pachitea River · Urubamba River · Madre de Dios River · Beni River · Purus River · Madeira River

SEE INSET OF SANTA ELENA FIELDS

SEE INSET OF PERU COASTAL FIELDS

SECHURA DESERT

**SANTA ELENA FIELDS**

Salinas · PETROPOLIS · RAIMUNDO · Libertad · CAUTIVO · SN. LUIS · ACHALLAN STA. PAULA · ANCAN · TIGRE · SANTA TOMAS · Ancan · Chanduy

0 2 6 Miles
0 2 6 Kilometers

**PERU COASTAL FIELDS**

0 8 16 Miles
0 8 16 Kilometers

ZORRITOS · PTA. BRAVO-CARPITA · LOS ORGANOS · Fernandez · CABO BLANCO · NEW SHALLOW · RESTIN · EL ALTO · DOUGLAS · LOBITOS · PARINAS · Talara · MILE · Negritos · ANCHA · LABREA · NEGRITOS · VERDUN · LOMITOS · LAGUNITOS · PORTACHUELO · La Huaca · Sullana

China River

**BOLIVIAN FIELDS**

0 20 40 Miles
0 40 Kilometers

Monteagudo · CAMIRI · GUAIRUY · LOS MONOS · Entre Rios · Tarija · SANANDITA · MADRE JONES · DURAN · SAN PEDRO · BERMEJO · TRANQUITOS

*ate companies at the end of*
*7 held oil concessions in Ecuador*
*approximately 35 million acres.*

# WORL
# OIL M
# ECUAD

Published as a
INTERNATIONA
of WORLD O

76° 72° 68°

COLOMBIA

ECUADOR

PERU

BRAZIL

BOLIVIA

CHILE

ARGENTINA

OCEAN

Napo River
Putumayo River
Amazon River
Iquitos
Nauta
Pastaza River
Barja
Marañon River
Requena
Yavari River
Ucayali River
Huallaga River
Tayabamba
San Martin
Bolivar
MAQUIA
Contamana
Yavua River
Ucalpe
AGUA CALIENTE
Puerto Pardo
Tayabama
Huaras
Llata
Aija
Huanco
Ambo
Cajatambo
Cerro de Pasco
Huacho
Canta
Callao
Lima
Huancayo
Huancavelia
Pisco
Huaitara
Ica
Puquio
Yauri
Chivay
Puno
Lake Titicaca
Aplao
Camana
Arequipa
Mollendo
Tacna
Arica
La Paz
Viacha
Sica Sica
Oruro
Uncia
Lake Poopo
Rio Mulatos
Iquique
Uyumi
Antofagasta
Puerto Madonado
Cobija
Madeira River
Beni River
Lake Rogagua

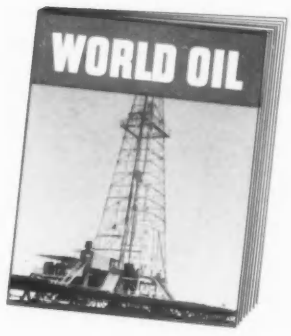
**BOLIVIAN FIELDS**

0 20 40 Miles
0 40 Kilometers

Monteagudo
CAMIRI
GUAIRUY
LOS MONOS
Entre Rios
Tarija
SANANDITA
MADRE JONES
DURAN
SAN PEDRO
BERMEJO
TRANQUITOS

# RLD OIL'S 1958
# MAP OF PERU,
# DOR, BOLIVIA

as a Supplement to the
ONAL OUTLOOK ISSUE
LD OIL, August 15, 1958




OIL FIELDS ★ Refineries
Oil Pipe Lines ○ Towns
Areas on which oil concessions have been granted.

0 50 100 200 Miles
0 50 100 200 Kilometers

64° 60° 0° 4° 8° 12° 16° 20° 24°

Manoa
Trinidad
Cochamba
Uncia
Sucre
Zudañez
Potosi
Puerto Suarez
GUAIRUY
SEE INSET OF BOLIVIAN FIELDS
Tarija
Sanandita
BERMEJO
Jujuy
Lake Rogagua
Mamoré River
Guapore River
Tuichi River
Pilcomayo River

*Private companies own concessions or government contracts on about 16 million acres in Bolivia.*

*Private companies hold all concession areas in Paraguay*

BOLIVIA
PARAGUAY
ARGENTINA